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New York State Museum

JOHN M. CLARKE Director

Bulletin 88

ZOOLOGY 11

CHECK LIST

OF THE

MOLLUSCA OF NEW YORK

BY

ELIZABETH J. LETSON

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PREFACE

The study of the recent Mollusca, *La belle science* as it has been termed, is very attractive to many intelligent persons and the interest in recent shells is widespread throughout the State. Since the publication of the illustrated descriptions of the New York Mollusca by James E. De Kay in 1843, as a part of the Natural History of New York, only occasional efforts have been made by the State Museum to bring present knowledge of these creatures to a fuller expression. It would doubtless be well, after this lapse of more than 60 years, to portray in monographic detail the molluscan fauna of the State in its scientific and economic bearings. Pending the inauguration of such an undertaking, it is believed that the complete list of species of our Mollusca with references to places of description herewith presented, will serve a useful purpose. It comprehends all verified species of our molluscan fauna and it invites suggestions and emendations from students of the subject. This list has been prepared at the suggestion of my predecessor in office, Dr F. J. H. Merrill, by Miss Elizabeth J. Letson, director of the Museum of the Buffalo Society of Natural Sciences, a keen and accomplished student of this branch of science.

John M. Clarke
Director

New York State Education Department

New York State Museum

JOHN M. CLARKE Director

Bulletin 88

ZOOLOGY 11

CHECK LIST

OF THE

MOLLUSCA OF NEW YORK

COMMUNICATED BY ELIZABETH J. LETSON

Class **CEPHALOPODA**

Order DIBRANCHIATA

Suborder DECAPODA

Family LOLIGINIDAE

Genus LOLIGO Lamarck

Loligo peali Lesueur

Loligo punctata DeK. DeKay, Nat. Hist. N. Y. 1843. p.3. (Long Island)

Loligo pealii DeK. DeKay, Nat. Hist. N. Y. 1843. p.4

Loligo punctata DeK. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.404. (Long Island sound)

Loligo pealii Les. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.405. (Long Island sound)

Loligo pallida Verrill

Loligo pallida Ver. Tryon, Man. Conch. 1879. 1:143. (Long Island sound)

Family OMMATOSTREPHIDAE

Genus OMMATOSTREPHES D'Orbigny

Ommatostrephes saggittatus Lamarck

Loligo illecebrosus Les. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.404. (Long Island sound)

Ommatostrephes saggittatus Lam. Tryon, Man. Conch. 1879. 1:177

Family SPIRULIDAE

Genus SPIRULA Lamarck

Spirula peroni Lamarck

Spirula peronii Lam. DeKay, Nat. Hist. N. Y. 1843. p.5

Spirula peronii Lam. Tryon, Man. Conch. 1879. 1:205

Class **GASTROPODA**

Order PECTINIBRANCHIATA

Family MURICIDAE

Genus UROSALPINX Stimpson

Urosalpinx cinerea Say

Fusus cinereus Say. DeKay, Nat. Hist. N. Y. 1843. p.145

Fusus imbricatus DeK. DeKay, Nat. Hist. N. Y. 1843. p.147

Fusus cinereus Say. Jay, Cat. 1852. p.321

Buccinum plicosum Mke. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Urosalpinx cinerea Say. Tryon, Man. Conch. 1880. 2:152

Genus EUPLEURA Adams

Eupleura caudata Say

Eupleura caudata Say. Tryon, Man. Conch. 1880. 2:157

Genus TROPHON Adams

Trophon clathratus Linnaeus

Fusus bamfius Mont. DeKay, Nat. Hist. N. Y. 1843. p.148

Trophon clathratus Linn. Tryon, Man. Conch. 1880. 2:140

Trophon scalariformis Gould

Fusus scalariformis Gld. DeKay, Nat. Hist. N. Y. 1843. p.143

Subfamily PURPURINAE

Genus PURPURA Bruguière

Purpura lapillus Linnaeus

Purpura lapillus Linn. DeKay, Nat. Hist. N. Y. 1843. p.135

Purpura imbricata Lam. DeKay, Nat. Hist. N. Y. 1843. p.136

Purpura bizonalis Lam. DeKay, Nat. Hist. N. Y. 1843. p.136

Purpura lapillus Linn. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Purpura lapillus Linn. Tryon, Man. Conch. 1880. 2:171

Family BUCCINIDAE

Subfamily NEPTUNIINAE

Genus NEPTUNEA Bolten

Neptunea despecta Linnaeus

Fusus tornatus Gld. DeKay, Nat. Hist. N. Y. 1843. p.148

Neptunea despecta Linn. Tryon, Man. Conch. 1881. 3:116

Neptunea decemcostata Say

Fusus decemcostatus Say. DeKay, Nat. Hist. N. Y. 1843. p.145

Neptunea decemcostata Say. Tryon, Man. Conch. 1881. 3:118

Genus SIPHO Klein

Sipho islandicus Chemnitz

Fusus islandicus Chem. DeKay, Nat. Hist. N. Y. 1843. p.144

Sipho islandicus Chem. Tryon, Man. Conch. 1881. 3:123

Sipho stimpsoni Mörch

Sipho stimpsoni Mörch. Tyron, Man. Conch. 1881. 3:126

Sipho pygmaeus Gould

Sipho pygmaeus Gld. Tryon, Man. Conch. 1881. 3:129

Sipho ventricosus Gray

Fusus ventricosus Gray. DeKay, Nat. Hist. N. Y. 1843. p.144

Sipho ventricosus Gray. Tryon, Man. Conch. 1881. 3:128

Genus FULGUR Montfort

Fulgur canaliculatum Linnaeus

Pyrula canaliculata Linn. DeKay, Nat. Hist. N. Y. 1843. p.140

Pyrula canaliculata Linn. Jay, Cat. 1852. p.328

Sycotypus canaliculatus Linn. Gill, Am. Jour. Conch. 1867. 3:149

Pyrula canaliculata Linn. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Fulgur canaliculatum Linn. Tryon, Man. Conch. 1881. 3:142

Fulgur carica Linnaeus

Pyrula carica Linn. DeKay, Nat. Hist. N. Y. 1843. p.141

Pyrula carica Linn. Jay, Cat. 1852. p.328

Pyrula aruana Linn. Jay, Cat. 1852. p.328

Fulgur carica Linn. Gill, Am. Jour. Conch. 1867. 3:145

Pyrula carica Linn. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Fulgur carica Linn. Tryon, Man. Conch. 1881. 3:140

Subfamily BUCCININAE

Genus BUCCINUM Linnaeus

Buccinum undatum Linnaeus

Buccinum undatum Linn. DeKay, Nat. Hist. N. Y. 1843. p.130

Buccinum undatum Linn. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Buccinum undatum Linn. Tryon, Man. Conch. 1881. 3:173

Family NASSIDAE

Genus NASSA Lamarck

Nassa trivittata Say

Buccinum trivittatum Say. DeKay, Nat. Hist. N. Y. 1843. p.132

Buccinum trivittatum Say. Jay, Cat. 1852. p.363

Nassa trivittata Say. Jay, Cat. 1852. p.365

Nassa trivittata Say. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Nassa trivittata Say. Tryon, Man. Conch. 1882. 4:42

Nassa vibex Say

Buccinum vibex Say. DeKay, Nat. Hist. N. Y. 1843. p.133

Nassa vibex Say. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Nassa vibex Say. Tryon, Man. Conch. 1882. 4:42

Nassa obsoleta Say

Buccinum obsoletum Say. DeKay, Nat. Hist. N. Y. 1843. p.133

Buccinum obsoletum Say. Jay, Cat. 1852. p.361

Buccinum noveboracensis Gray. Jay, Cat. 1852. p.361

Buccinum olivaeforme Kien. Jay, Cat. 1852. p.361

Nassa obsoleta Say. Jay, Cat. 1852. p.364

Nassa obsoleta Say. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.397

Nassa obsoleta Say. Tryon, Man. Conch. 1882. 4:60

Family COLUMBELLIDAE

Genus COLUMBELLA Lamarck

Columbella avara Say

Colombella avara Say. DeKay, Nat. Hist. N. Y. 1843. p.139

Columbella avara Say. Jay, Cat. 1852. p.347

Columbella avara Say. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Columbella avara Say. Tryon, Man. Conch. 1883. 5:159

Columbella lunata Say

Buccinum lunatum Say. DeKay, Nat. Hist. N. Y. 1843. p.131

Buccinum wheatleyi DeK. DeKay, Nat. Hist. N. Y. 1843. p.132

Buccinum lunatum Say. Jay, Cat. 1852. p.361

Columbella lunata Say. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Columbella gouldiana Agassiz. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Columbella lunata Say. Tryon, Man. Conch. 1883. 5:130

Genus BELA Gray

Bela decussata Couthouy

Pleurotoma decussata Couth. DeKay, Nat. Hist. N. Y. 1843. p.150

Bela decussata Couth. Tryon, Man. Conch. 1884. 6:217

Bela harpularia Couthouy

Fusus harpularius Couth. DeKay, Nat. Hist. N. Y. 1843. p.146

Bela harpularia Couth. Tryon, Man. Conch. 1884. 6:219

Bela bicarinata Couthouy

Pleurotoma bicarinata Couth. DeKay, Nat. Hist. N. Y. 1843. p.149

Pleurotoma bicarinatum Couth. Verrill, U. S. Fish Com. Rep't 1871-72. p.638 (Stonington Ct.).

Bela bicarinata Couth. Tryon, Man. Conch. 1884. 6:214

Bela concinnula Verrill

Bela concinnula Ver. Tryon, Man. Conch. 1884. 6:220

Bela pleurotomaria Couthouy

Fusus rufus Mont. DeKay, Nat. Hist. N. Y. 1843. p.146

Mangelia pyramidalis St. Smith & Prime, An. Lyc. N. Y. IX. 1870. p.398

Bela pleurotomaria Couth. Gould, Invert. Mass. ed. 2. 1870. p.355

Genus CLATHURELLA Recluz

Clathurella plicata Adams

Pleurotoma plicata Ads. DeKay, Nat. Hist. N.Y. 1843. p.150

Pleurotoma plicatum Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:398

Clathurella plicata Ads. Tryon, Man. Conch. 1884. 6:277

Subgenus DAPHNELLA Hinds

Daphnella morchi Malon

Daphnella morchi Malon. Tryon, Man. Conch. 1884. 6:315

Daphnella agassizi Verrill & Smith

Daphnella agassizii Ver. & Sm. Tryon, Man. Conch. 1884. 6:316

Daphnella cerina Kurtz & Stimpson

Pleurotoma cerinum K. & St. Smith & Prime, An. Lyc. N. Y. 1870. 9:398

Daphnella cerina K. & St. Tryon, Man. Conch. 1884. 6:310

Family NATICIDAE

Genus NATICA Lamarck

Natica pusilla Say

Natica pusilla Say. DeKay, Nat. Hist. N. Y. 1843. p.123

Natica pusilla Say. Jay, Cat. 1852. p.293

Natica pusilla Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:396

Natica pusilla Say. Tryon, Man. Conch. 1886. 8:31

Natica duplicata Say

Natica duplicata Say. DeKay, Nat. Hist. N. Y. 1843. p.121

Natica duplicata Say. Jay, Cat. 1852. p.292

Natica duplicata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:396

Natica duplicata Say. Tryon, Man. Conch. 1886. 8:33

Natica heros Say

Natica heros Say. DeKay, Nat. Hist. N. Y. 1843. p.120

Natica triseriata Say. DeKay, Nat. Hist. N. Y. 1843. p.121

Natica heros Say. Jay, Cat. 1852. p.292

Natica triseriata Say. Jay, Cat. 1852. p.293

Natica triseriata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:395

Natica heros Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:395

Natica triseriata Say. Tryon, Man. Conch. 1886. 8:36

Natica heros Say. Tryon, Man. Conch. 1886. 8:35

Natica immaculata Totten

Natica immaculata Tott. DeKay, Nat. Hist. N. Y. 1843. p.122

Natica immaculata Tott. Smith & Prime, An. Lyc. N. Y. 1870. 9:396

Natica immaculata Tott. Tryon, Man. Conch. 1886. 8:38

Natica clausa Sowerby

Natica clausa Sby. DeKay, Nat. Hist. N Y. 1843. p.122
Natica clausa Sby. Jay, Cat. 1852. p.291
Natica clausa Sby. Tyron, Man. Conch. 1886. 8:30

Natica flava Gould

Natica flava Gld. DeKay, Nat. Hist. N. Y. 1843. p.123
Natica flava Gld. Tryon, Man. Conch. 1886. 8:52

Genus SIGARETUS Lamarck

Sigaretus perspectivus Say

Sigaretus perspectivus Say. DeKay, Nat. Hist. N. Y. 1843. p.153
Sigaretus perspectivus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:396
Sigaretus perspectivus Say. Tryon, Man. Conch. 1886. 8:57

Genus VELUTINA Fleming

Velutina laevigata Pennant

Velutina laevigata Penn. DeKay, Nat. Hist. N. Y. 1843. p.154
Velutina laevigata Penn. Tryon, Man. Conch. 1886. 8:65

Velutina zonata Gould

Velutina zonata Gld. DeKay, Nat. Hist. N. Y. 1843. p.154
Velutina zonata Gld. Tryon, Man. Conch. 1886. 8:66

Family LAMELLARIIDAE

Genus LAMELLARIA Montagu

Lamellaria pellucida Verrill

Lamellaria pellucida Ver. Tryon, Man. Conch. 1886. 8:61

Lamellaria glabra Couthouy

Lamellaria glabra Couth. Tryon, Man. Conch. 1886. 8:64

Family CALYPTRAEIDAE

Genus CRUCIBULUM Schumacher

Crucibulum striatum Say

Calyptrea striata Say. DeKay, Nat. Hist. N. Y. 1843. p.155
Calyptrea striata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Crucibulum striatum Say. Tryon, Man. Conch. 1886. 8:118

Genus CREPIDULA Lamarck

Crepidula fornicata Lamarck

Crepidula fornicata Lam. DeKay, Nat. Hist. N. Y. 1843. p.157

Crepidula fornicata Lam. Jay, Cat. 1852. p.107
Crepidula fornicata Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9.392
Crepidula fornicata Lam. Tryon, Man. Conch. 1886. 8:124

Crepidula convexa Say

Crepidula convexa Say. DeKay, Nat. Hist. N. Y. 1843. p.158
Crepidula convexa Say. Jay, Cat. 1852. p.107
Crepidula convexa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Crepidula convexa Say. Tryon, Man. Conch. 1886. 8:125

Crepidula plana Say

Crepidula plana Say. DeKay, Nat. Hist. N. Y. 1843. p.158
Crepidula plana Say. Jay, Cat. 1852. p.107
Crepidula unguiformis Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Crepidula unguiformis Lam. Tryon, Man. Conch. 1886. 8:130

Crepidula glauca Say

Crepidula glauca Say. DeKay, Nat. Hist. N. Y. 1843. p.159
Crepidula glauca Say. Tryon, Man. Conch. 1886. 8:125

Family SOLARIIDAE

Genus TORINIA Gray

Torinia borealis Verrill & Smith

Torinia borealis Ver. & Sm. Tryon, Man. Conch. 1887. 9:22

Genus SCALA Humphrey

Scala angulata Say

Scalaria angulata Say. Tryon, Man. Conch. 1887. 9:70

Scala multistriata Say

Scalaria multistriata Say. DeKay, Nat. Hist. N. Y. 1843. p.126
Scalaria multistriata Say. Tryon, Man. Conch. 1887. 9:72

Scala humphreysii Kien

Scalaria humphreysii Kien. Smith & Prime, An. Lyc. N. Y. 1870. 9:395

Scala lineata Say

Scalaria lineata Say. DeKay, Nat. Hist. N. Y. 1843. p.126
Scalaria lineata Say. Jay, Cat. 1852. p.300

Scalaria lineata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:394
Scalaria lineata Say. Tryon, Man. Conch. 1887. 9:79

Family IANTHINIDAE

Genus IANTHINA Lamarck

Ianthina fragilis Bruguière

Janthina fragilis Brug. DeKay, Nat. Hist. N. Y. 1843. p.125
Ianthina fragilis Brug Tryon, Man. Conch. 1887. 9:36

Family TURRITELLIDAE

Genus TURRITELLA Lamarck

Turritella erosa Couthouy

Turritella erosa Couth. DeKay, Nat. Hist. N. Y. 1843. p.113
Turritella erosa Couth. Tryon, Man. Conch. 1886. 8:208

Family VERMETIDAE

Genus VERMETUS Adanson

Vermetus spiratus radicula Stimpson

Vermetus radicula St. Smith & Prime, An. Lyc. N. Y. 1870. 9:394
Vermetus spiratus v. radicula St. Tryon, Man. Conch. 1886. 8:187

Family CAECIDAE

Genus CAECUM Fleming

Caecum cooperi Smith

Caecum cooperii Sm. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Caecum cooperi Sm. Verrill, Ct. Acad. Arts & Sci. 1882. 5:525
Caecum cooperii Sm. Tryon, Man. Conch. 1886. 8:221

Caecum pulchellum Stimpson

Caecum pulchellum St. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Caecum pulchellum St. Tryon, Man. Conch. 1886. 8:217

Family EULIMIDAE

Genus EULIMA Risso

Eulima intermedia Cantraine

Eulima intermedia Cant. Tryon, Man. Conch. 1886. 8:274

Eulima oleacea Kurtz & Stimpson

Eulima oleacea K. & St. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Eulima oleacea K. & St. Tryon, Man. Conch. 1886. 8:273

Genus STYLIFER Broderip

Stylifer stimpsoni Verrill

Stylifer stimpsonii Ver. Tryon, Man. Conch. 1886. 8:298

Family TURBONILLIDAE

Genus TURBONILLA Risso

Turbonilla interrupta Totten

Turritella interrupta Tott. DeKay, Nat. Hist. N. Y. 1843. p.112

Chemnitzia interrupta Tott. Smith & Prime, An. Lyc. N. Y. 1870. 9:395

Turbonilla interrupta Tott. Tryon, Man. Conch. 1886. 8:329

Turbonilla elegans Verrill

Turbonilla elegans Ver. Verrill, U. S. Fish Com. Rep't 1871-72. p.657. (Long Island sound near New Haven)

Turbonilla elegans Ver. Verrill, Ct. Acad. Arts & Sci. 1882. 5:538

Turbonilla elegans Ver. Tryon, Man. Conch. 1886. 8:328

Turbonilla stricta Verrill

Turbonilla stricta Ver. Verrill, U. S. Fish Com. Rep't 1871-72. p.659. (Long Island sound near New Haven)

Turbonilla stricta Ver. Verrill, Ct. Acad. Arts & Sci. 1882. 5:537

Turbonilla stricta Ver. Tryon, Man. Conch. 1886. 8:329

Turbonilla costulata Verrill

Turbonilla costulata Ver. Verrill, U. S. Fish Com. Rep't 1871-72. p.658. (Long Island sound near New Haven)

Turbonilla costulata Ver. Verrill, Ct. Acad. Arts & Sci. 1882. 5:537

Turbonilla costulata Ver. Tryon, Man. Conch. 1886. 8:329

Turbonilla areolata Verrill

Turbonilla areolata Ver. Verrill, U. S. Fish Com. Rep't 1871-72. p.658. (Long Island sound at New Haven)

Turbonilla areolata Ver. Verrill, Ct. Acad. Arts & Sci. 1882. 5:537

Turbonilla areolata Ver. Tryon, Man. Conch. 1886. 8:328

Turbonilla grandis Verrill

Turbonilla grandis Ver. Tryon, Man. Conch. 1886. 8:329

Genus ACLIS Lovèn

Aclis striata Verrill

Aclis striata Ver. Tryon, Man. Conch. 1887. 9:87

Genus ODOSTOMIA Fleming

Odostomia trifida Totten

Odostomia trifida Tott. DeKay, Nat. Hist. N.Y. 1843. p.114
Chemnitzia trifida Tott. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Odostomia trifida Tott. Tryon, Man. Conch. 1886. 8:356

Odostomia bisuturalis Say

Chemnitzia bisuturalis Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Odostomia bisuturalis Say. Tryon, Man. Conch. 1886. 8:357

Odostomia impressa Say

Odostomia insculpta DeKay. DeKay, Nat. Hist. N. Y. 1843. p.115
Odostomia insculpta DeKay. Jay, Cat. 1852. p.475
Chemnitzia impressa Kurtz. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Odostomia impressa Say. Tryon, Man. Conch. 1886. 8:356

Odostomia seminuda Adams

Odostomia seminuda Ads. DeKay, Nat. Hist. N. Y. 1843. p.115
Chemnitzia seminuda Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Odostomia seminuda Ads. Tryon, Man. Conch. 1886. 8:357

Odostomia fusca Adams

Odostomia fusca Ads. DeKay, Nat. Hist. N. Y. 1843. p.116
Chemnitzia fusca Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:395
Odostomia fusca Ads. Tryon, Man. Conch. 1886. 8:356

Family LITTORINIDAE

Genus LITTORINA Ferussac

Littorina irrorata Say

Littorina irrorata Say. DeKay, Nat. Hist. N. Y. 1843. p.106
Littorina irrorata Say. Jay, Cat. 1852. p.310
Littorina irrorata Gray. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Littorina irrorata Say. Tryon, Man. Conch. 1887. 9:246

Littorina rudis Donovan

Littorina rudis Donov. DeKay, Nat. Hist. N. Y. 1843. p.104
Littorina rudis Donov. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Littorina rudis Donov. Tryon, Man. Conch. 1887. 9:241

Littorina rudis obligata Say

Littorina rudis v. obligata Say. Tryon, Man. Conch. 1887. 9:241

Littorina rudis tenebrosa Montagu

Littorina tenebrosa Mont. DeKay, Nat. Hist. N. Y. 1843. p.105
Littorina tenebrosa Mont. Jay, Cat. 1852. p.311
Littorina rudis v. tenebrosa Mont. Tryon, Man. Conch. 1887. 9:242

Littorina littorea Linnaeus

Littorina littorea Linn. Tryon, Man. Conch. 1887. 9:240

Littorina palliata Say

Littorina palliata Say. DeKay, Nat. Hist. N. Y. 1843. p.106
Littorina palliata Say. Jay, Cat. 1852. p.131
Littorina littoralis Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Littorina littoralis Linn. Tryon, Man. Conch. 1887. 9:242

Genus LACUNA Turton

Lacuna divaricata Fabricius

Lacuna vincta Mont. DeKay, Nat. Hist. N. Y. 1843. p.111
Lacuna pertusa Conr. Jay, Cat. 1852. p.312
Lacuna vincta Turt. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Lacuna divaricata Fab. Tryon, Man. Conch. 1887. 9:266

Family CERITHIIDAE

Genus BITTIUM Leach

Bittium nigrum Totten

Cerithium sayi Gld. DeKay, Nat. Hist. N. Y. 1843. p.128
Cerithium sayi Mke. Smith & Prime, An. Lyc. N. Y. 1870. 9:394
Bittium nigrum Tott. Tryon, Man. Conch. 1887. 9:152

Genus CERITHIOPSIS Forbes & Hanley

Cerithiopsis greeni C. B. Adams

Cerithium greenii Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:394
Cerithiopsis greenii Ads. Tryon, Man. Conch. 1887. 9:170

Cerithiopsis emersoni Stimpson

Cerithiopsis emersonii St. Smith & Prime, An. Lyc. N. Y. 1870. 9:397

Cerithiopsis punctatum Linn. Tryon, Man. Conch. 1887. 9:170

Cerithiopsis terebrale C. B. Adams

Cerithiopsis terebellum St. Smith & Prime, An. Lyc. N. Y. 1870. 9:397

Cerithiopsis terebrale Ads. Tryon, Man. Conch. 1887. 9:174

Genus TRIFORIS Deshayes

Triforis nigrocinctus C. B. Adams

Cerithium nigrocinctum Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:394

Triforis nigrocinctus Ads. Tryon, Man. Conch. 1887. 9:188

Family STREPOMATIDAE

Genus PLEUROCERA Rafinesque

Pleurocera subulare Lea

Melania subularis Lea. Lea, Obs. Genus Unio. 1834. 1:110. (Niagara river)

Melania subularis Lea. DeKay, Nat. Hist. N. Y. 1843. p.92. (Lake Erie)

Melania subularis Lea. Jay, Cat. 1852. p.275. (Niagara river)

Pleurocera subulare Lea. Tryon, Am. Jour. Conch. 1865. 1:307. (Erie canal, St Lawrence, Niagara river)

Melania subularis Lea. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Trypanostoma subulare Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139

Pleurocera subulare Lea. Tryon, Smith. Misc. Coll. 253. 1880 16:88. (Niagara river)

Pleurocera subulare Lea. Beauchamp, Onondaga List. 1886. p.6

Pleurocera subulare Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Lake Erie)

Pleurocera subulare Lea. Letson, N. Y. State Mus. Bul. 45. 1901. p.239. (Goat island. Post-Pliocene)

Pleurocera subulare intensum Anthony

Pleurocera intensum Anth. Beauchamp, Onondaga List. 1886. p.6

Pleurocera pallidum Lea

Trypanostoma pallidum Lea. Lea, Obs. Genus Unio. 1862. 9:97. (Niagara falls)

Pleurocera pallidum Lea. Tryon, Am. Jour. Conch. 1865. 1:311. (Niagara falls)

Trypanostoma pallidum Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (Niagara river)

Pleurocera pallidum Lea. Tryon, Smith. Misc. Coll. 253. 1880. 16:112. (Niagara river)

Pleurocera pallidum Lea. Beauchamp, Onondaga List. 1886. p.6

Pleurocera elevatum Say

Melania elevata Say. Aldrich, Troy List. 1867. p.4

Pleurocera elevatum Say. Tryon, Smith. Inst. Coll. 253. 1880. 16:95

Genus GONIOBASIS Lea

Goniobasis depygis Say

Melania depygis Say. DeKay, Nat. Hist. N. Y. 1843. p.89. (Lake Champlain, Hudson river)

Melania depygis Say. Stimpson, List. 1851. p.32. (Lake Champlain)

Goniobasis depygis Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (Lake Champlain)

Goniobasis depygis Say. Beauchamp, Onondaga List. 1886. p.6

Goniobasis depygis Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Irondequoit bay)

Goniobasis livescens Menke

Melania livescens Mke. Jay, Cat. 1852. p.274. (Lake Erie)

Goniobasis livescens Mke. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (Niagara river)

Goniobasis livescens Mke. Tryon, Smith. Misc. Coll. 253. 1880. 16:248. (Lake Erie)

Goniobasis livescens Mke. Beauchamp, Onondaga List. 1886. p.6

Goniobasis livescens Mke. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Erie canal)

Goniobasis livescens Mke. Letson, N. Y. State Mus. Bul. 45. 1901. p.239. (Goat island. Post-Pliocene)

Goniobasis niagarensis Lea

Melania niagarensis Lea. Lea, Obs. Genus Unio. 1842. 3:11. (Niagara falls)

Melania niagarensis Lea. DeKay, Nat. Hist. N. Y. 1843. p.90

Melania niagarensis Lea. Jay, Cat. 1852. p.274. (Niagara falls)

Goniobasis niagarensis Lea. Tryon, Smith. Misc. Coll. 253. 1880. 16:248

Goniobasis niagarensis Lea. Letson, N. Y. State Mus. Bul. 45. 1901. p.240. (Goat island. Post-Pliocene)

Goniobasis haldemani Tryon

Goniobasis haldemani Try. Tryon, Am. Jour. Conch. 1865. 1:38. (Lakes Erie and Champlain)

Goniobasis haldemani Try. Tryon, Am. Jour. Conch. 1866. 2:38. (Lakes Erie and Champlain)

Goniobasis haldemani Try. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (St Lawrence river)

Goniobasis haldemani Try. Tryon, Smith. Misc. Coll. 253. 1880. 16:282. (Lakes Erie and Champlain)

Goniobasis haldemani Try. Beauchamp, Onondaga List. 1886. p.6. (Erie canal)

Goniobasis haldemani Try. Letson, N. Y. State Mus. Bul. 45. 1901. p.240. (Goat island. Post-Pliocene)

Goniobasis virginica Gmelin

Melania virginica Gmel. DeKay, Nat. Hist. N. Y. 1843. p.90. (Raritan river)

Melania bizonalis DeK. DeKay, Nat. Hist. N. Y. 1843. p.91. (Lake Champlain)

Melania gemma DeK. DeKay, Nat. Hist. N. Y. 1843. p.91. (Onondaga county)

Melania virginica Gmel. Say, Conch. U. S. ed. by Binney. 1858. p.131. (Niagara falls)

Melania virginica Gmel. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Goniobasis virginica Gmel. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p 139

Goniobasis gemma DeK. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (Onondaga county)

Goniobasis virginica Gmel. Tryon, Smith. Misc. Coll. 253. 1880. 16:290

Melania bizonalis DeK. Tryon, Smith. Misc. Coll. 253. 1880. 16:293. (Lake Champlain)

Melania gemma DeK. Tryon, Smith. Misc. Coll. 253. 1880. 16:293. (Onondaga county)

Goniobasis virginica Gmel. Beauchamp, Onondaga List. 1886. p.6

Goniobasis gemma DeK. Beauchamp, Onondaga List. 1886. p.6

Goniobasis virginica Gmel. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Erie canal)

Goniobasis multilineata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Erie canal)

Genus ANCYLOSA Say

Ancylosa carinata Bruguière

Anculotus carinatus DeK. DeKay, Nat. Hist. N. Y. 1843. p.101. (Lake Champlain)

Anculotus trivittatus DeK. DeKay, Nat. Hist. N. Y. 1843. p.102. (Lake Champlain)

Anculotus carinatus DeK. Jay, Cat. 1852. p.276. (Lake Champlain)

Anculosa dissimilis Say. Say, Am. Jour. Conch. 1866. 2:126

Anculosa carinata Brug. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139. (Cortland county)

Anculosa carinata Brug. Tryon, Smith. Misc. Coll. 253. 1880. 16:390. (Lake Champlain)

Family RISSOIDAE

Subfamily BYTHININAE

Genus BYTHINIA Gray

Bythinia tentaculata Linnaeus

Bythinia tentaculata Linn. Beauchamp, Onondaga List. 1886. p.5. (Syracuse)

Bythinia tentaculata Linn. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.4. (Erie canal)

Subfamily SCENEINAE

Genus SCENEA Fleming

Scenea planorbis Fabricius

Skenea serpuloides Ads. DeKay, Nat. Hist. N. Y. 1843. p.117

Skenea planorbis Fabr. Tryon, Man. Conch. 1887. 9:398

Subfamily RISSOINAE

Genus RISSOA Fremenville

Rissoa minuta Totten

Cingula minuta Tott. DeKay, Nat. Hist. N. Y. 1843. p.110
Rissoa minuta Tott. Tryon, Man. Conch. 1887. 9:346

Rissoa aculeus Gould

Cingula aculeus Gld. DeKay, Nat. Hist. N. Y. 1843. p.110
Rissoa aculeus St. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Rissoa aculeus Gld. Tryon, Man. Conch. 1887. 9:347

Rissoa stimpsoni Smith

Rissoa stimpsoni Smith. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Rissoa stimpsoni Smith. Tryon, Man. Conch. 1887. 9:345

Rissoa laevis DeKay

Cingula laevis DeK. DeKay, Nat. Hist. N. Y. 1843. p.111
Rissoa laevis DeK. Smith & Prime, An. Lyc. N. Y. 1870. 9:393
Hydrobia laevis DeK. Verrill, Ct. Acad. Arts & Sci. 1882. 5:523
Rissoa laevis DeK. Tryon, Man. Conch. 1887. 9:346

Rissoa latior Mighels & Adams

Rissoa latior Migh. & Ads. Tryon, Man. Conch. 1887. 9:357

Rissoa areolata Stimpson

Rissoa areolata St. Tryon, Man. Conch. 1887. 9:361

Subfamily HYDROBIINAE

Genus BYTHINELLA Moquin-Tandon

Bythinella attenuata Haldeman

Bythinella attenuata Hald. Binney, Smith. Misc. Coll. 144. 1865. p.68. (New York)

Bythinella obtusa Lea

Bythinella obtusa Lea. Binney, Smith. Misc. Coll. 144. 1865. 7:70
Bythinella obtusa Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138
Bythinella obtusa Lea. Beauchamp, Onondaga List. 1886. p.5
Bythinella obtusa Lea. Letson, N. Y. State Mus. Bul. 45. 1901. p.242. (Goat island. Post-Pliocene)

Genus AMNICOLA Gould & Haldeman

Amnicola sayana Anthony

Amnicola sayana Anth. Binney, Smith. Misc. Coll. 144. 1865. 7:81

Amnicola sayana Anth. Beauchamp, Onondaga List. 1886. p.5. (Erie canal)

Amnicola pallida Haldeman

Amnicola pallida Hald. Binney, Smith. Misc. Coll. 144. 1865. 7:83. (Lake Champlain)

Amnicola pallida Hald. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138. (Lake Champlain)

Amnicola pallida Hald. Beauchamp, Onondaga List. 1886. p.5

Amnicola pallida Hald. Walton, Rochester Acad. Sci. Proc. 1892. 2:4

Amnicola limosa Say

Amnicola porata Say. DeKay, Nat. Hist. N. Y. 1843. p.88. (Cayuga lake)

Paludina porata Say. Say, Conch. U. S. ed. by Binney. 1858. p.69. (Cayuga lake)

Amnicola limosa Say. Binney, Smith. Misc. Coll. 144. 1865. 7:84

Amnicola limosa Say. Aldrich, Troy List. 1867. p.4. (Hudson river)

Amnicola porata Gld. Smith & Prime, An. Lyc. N. Y. 1870. 9:392. (Long Island)

Amnicola porata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138. (Cayuga lake)

Amnicola limosa Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138. (Cayuga lake)

Amnicola porata Say. Beauchamp, Onondaga List. 1886. p.5

Amnicola limosa Say. Beauchamp, Onondaga List. 1886. p.5

Amnicola porata Say. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.4. (Erie canal)

Amnicola limosa Say. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.4. (Genesee river)

Amnicola limosa Say. Letson, N. Y. State Mus. Bul. 45 1901. p.241. (Goat island. Post-Pliocene)

Amnicola cincinnatiensis Anthony

Amnicola cincinnatiensis Anth. Binney, Smith. Misc. Coll. 144. 1865. 7:85

Amnicola cincinnatiensis Anth. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138

Amnicola cincinnatiensis Anth. Beauchamp, Onondaga List. 1886. p.5. (Erie canal)

Amnicola orbiculata Lea

Amnicola orbiculata Lea. Binney, Smith. Misc. Coll. 144. 1865. 7:87. (Cayuga lake)

Amnicola orbiculata Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138. (Cayuga lake)

Amnicola orbiculata Lea. Beauchamp, Onondaga List. 1886. p.5

Amnicola orbiculata Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:4

Amnicola lustrica Say

Amnicola lustrica Say. DeKay, Nat. Hist. N. Y. 1843. p.87. (Lakes Champlain and Cayuga)

Paludina lustrica Say. Say, Conch. U. S. ed. by Binney. 1858. p.69. (Cayuga lake)

Pomatiopsis lustrica Say. Binney, Smith. Misc. Coll. 144. 1865. 7:94. (Cayuga lake and Mohawk river)

Amnicola lustrica Say. Aldrich, Troy List. 1867. p.5. (Hudson river)

Amnicola lustrica Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138. (Cayuga lake)

Amnicola lustrica Say. Beauchamp, Onondaga List. 1886. p.5

Pomatiopsis lustrica Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4

Amnicola letsoni Walker

Amnicola letsoni Walk. Walker, Naut. 1901. 14:113. (Goat island. Post-Pliocene)

Amnicola letsoni Walk. Letson, N. Y. State Mus. Bul. 45. 1901. p.241. (Goat island. Post-Pliocene)

Genus LYOGYRUS Gill

Lyogyrus granum Say

Amnicola granua Say. Beauchamp, Onondaga List. 1886. p.5. (Seneca river)

Amnicola granum Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4

Subfamily LITHOGLYPHINAE

Genus GILLIA Stimpson

Gillia altilis Lea

Gillia altilis Lea. Binney, Smith. Misc. Coll. 144. 1865. 7:74

Gillia altilis Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138

Gillia altilis Lea. Beauchamp, Onondaga List. 1886. p.5

Gillia altilis Lea. Walton, Rochester Acad. Sci. Proc. 1892 2:4. (Erie canal)

Genus SOMATOGYRUS Gill

Somatogyrus isogonus Say

Paludina isogona Say. DeKay, Nat. Hist. N. Y. 1843. p.85. (Western New York)

Somatogyrus subglobosus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.138

Somatogyrus isogonus Say. Beauchamp. Onondaga List. 1886. p.5

Somatogyrus integer Say

Somatogyrus integer Say. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Subfamily POMATIOPSINAE

Genus POMATIOPSIS Tryon

Pomatiopsis lapidaria Say

Pomatiopsis lapidaria Say. Binney, Smith. Misc. Coll. 144. 1865. 7:93

Pomatiopsis lapidaria Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.242. (Foster's flats. Post-Pliocene)

Family VALVATIDAE

Genus VALVATA Müller

Valvata tricarinata Say

Valvata tricarinata Say. DeKay, Nat. Hist. N. Y. 1843. p.118

Valvata unicarinata DeK. DeKay, Nat. Hist. N. Y. 1843. p.118. (Lake Champlain)

Valvata unicarinata DeK. Jay, Cat. 1852. p.278

Valvata carinata Say. Jay, Cat. 1852. p.277

Valvata tricarinata Say. Jay, Cat. 1852. p.278

Valvata tricarinata Say. Binney, Smith. Misc. Coll. 144. 1865. p.9. (Herkimer county)

Valvata tricarinata Say. Aldrich, Troy List. 1867. p.3

Valvata tricarinata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137. (Little Lakes)

Valvata tricarinata Say. Beauchamp, Onondaga List. 1886. p.5. (Onondaga lake)

Valvata tricarinata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Charlotte)

Valvata tricarinata Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.243. (Goat island. Post-Pliocene)

Valvata sincera Say

Valvata sincera Say. DeKay, Nat. Hist. N. Y. 1843. p.119. (Lakes Oneida, Champlain and Chautauqua)

Valvata sincera Say. Jay, Cat. 1852. p.278

Valvata sincera Say. Binney, Smith. Misc. Coll. 144. 1865. 7:12

Valvata sincera Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Valvata sincera Say. Beauchamp, Onondaga List. 1886. p.5. (Seneca river)

Valvata sincera Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Erie canal)

Valvata sincera Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.243. (Goat island. Post-Pliocene)

Family PALUDINIDAE

Genus VIVIPARA Montfort

Vivipara contectoides Binney

Vivipara contectoides Binn. Binney, Smith. Misc. Coll. 144. 1865. 7:23

Vivipara contectoides Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Genus CAMPELOMA Rafinesque

Campeloma ponderosum Say

Melantho ponderosa Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:4. (Erie canal)

Campeloma decisum Say

Paludina disscisa Say. DeKay, Nat. Hist. N. Y. 1843. p.84

Paludina integra Say. DeKay, Nat. Hist. N. Y. 1843. p.84. (Hudson river)

Paludina decisa Say. Jay, Cat. 1852. p.279

Melantho decisa Say. Binney, Smith. Misc. Coll. 144. 1865. 7:41. (Erie canal, Mohawk, Greenwich, Buffalo, Lakes Schuyler, Owasco and Cayuga)

Paludina decisa Say. Aldrich, Troy List. 1867. p.3. (Mohawk basin)

Paludina integra Say. Aldrich, Troy List. 1867. p.3

Paludina rufa Hald. Aldrich, Troy List. 1867. p.3. (Mohawk basin)

Paludina decisa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:392. (Jamaica L. I.)

Melantho decisus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Melantho integer Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Melantho rufus Hald. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137. (Buffalo)

Melantho decisus Say. Beauchamp, Onondaga List. 1886. p.5

Melantho rufus Hald. Beauchamp, Onondaga List. 1886. p.5. (Baldwinsville)

Melantho decisa Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Melantho rufa Hald. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Melantho decisa var. obesa Lewis. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Melantho decisa var. genicula Conr. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Melantho decisa var. integra Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Melantho decisa var. heterostropha Kirt. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Erie canal)

Campeloma decisa Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.243. (Goat island. Post-Pliocene)

Genus LIOPLAX Troschel

Lioplax subcarinata Say

Lioplax subcarinatus Say. Beauchamp, Onondaga List. 1886. p.5. (Erie canal)

Order SCUTIBRANCHIATA

Suborder PODOPTHALMA

Family TROCHIDAE

Genus MARGARITA Leach

Margarita ornata DeKay

Margarita ornata DeK. DeKay, Nat. Hist. N. Y. 1843. p.107

Margarita multilineata DeKay

Margarita multilineata DeK. DeKay, Nat. Hist. N. Y. 1843. p.109

Subgenus SOLARIELLA Adams

Solariella obscura planula Verrill

Solariella obscura planula Ver. Tryon, Man. Conch. 1889. 9:309

Suborder EDRIOPTHALMA

Family FISSURELLIDAE

Genus PUNCTURELLA Lowe

Puncturella noachina Linnaeus

Cemoria noachina Linn. DeKay, Nat. Hist. N. Y. 1843. p.156
Puncturella noachina Linn. Tryon, Man. Conch. 1890. 12:222

Subfamily ACMAEINAE

Genus ACMAEA Escholtz

Acmaea testudinalis Müller

Patelloida testudinalis Müll. DeKay, Nat. Hist. N. Y. 1843. p.162
Tectura testudinalis Gray. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Acmaea testudinalis Müll. Tryon, Man. Conch. 1891. 13:10

Acmaea testudinalis alveus Conrad

Patelloida alveus Conr. DeKay, Nat. Hist. N. Y. 1843. p.162
Lottia alveus Conr. Jay, Cat. 1852. p.103
Tectura alveus Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:392
Acmaea testudinalis var. alveus Conr. Tryon, Man. Conch. 1891. 13:10

Subclass OPISTHOBRANCHIATA

Order TECTIBRANCHIATA

Family PHILINIDAE

Genus PHILINE Ascanias

Philine quadratas Wood

Philine quadrata Wood. Tryon, Man. Conch. 1895. 16:19

Genus SCAPHANDER Montfort

Scaphander punctostriatus Mighels

Scaphander punctostriatus Migh. Tryon, Man. Conch. 1893. 15:246

Family TORNATELLIDAE

Subfamily TORNATELLINAE

Genus TORNATINA A. Adams

Tornatina canaliculata Say

Bulla canaliculata Say. DeKay, Nat. Hist. N. Y. 1843. p.19
Bulla obstricta Gld. DeKay, Nat. Hist. N. Y. 1843. p.15
Bulla canaliculata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:399
Tornatina canaliculata Say. Tryon, Man. Conch. 1893. 15:184

Genus ACTAEON Montfort

Actaeon punctostriata Adams

Tornatella punctostriata Ads. DeKay, Nat. Hist. N. Y. 1843. p.127
Tornatella puncto-striata Ads. Jay, Cat. 1852. p.296
Actaeon punctostriata Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:399
Actaeon punctostriata Ads. Tryon, Man. Conch. 1893. 15:157

Family CYLICHNIDAE

Genus CYLICHNA Lovèn

Cylichna oryza Totten

Bulla oryza Tott. DeKay, Nat. Hist. N. Y. 1843. p.18
Bulla oryza Tott. Smith & Prime, An. Lyc. N. Y. 1870. 9:399
Cylichna oryza Tott. Tryon, Man. Conch. 1893. 15:325

Cylichna alba Brown

Bulla triticea Couth. DeKay, Nat. Hist. N. Y. 1843. p.17
Cylichna alba Brn. Tryon, Man. Conch. 1893. 15:290

Genus RETUSA Brown

Retusa gouldi Couthouy

Bulla gouldii Couth. DeKay, Nat. Hist. N. Y. 1843. p.15
Retusa gouldii Couth. Tryon, Man. Conch. 1893. 15:217

Genus DIAPHANA Brown

Diaphana debilis Gould

Bulla debilis Gld. DeKay, Nat. Hist. N. Y. 1843. p.17
Diaphana debilis Gld. Tryon, Man. Conch. 1893. 15:281

Family BULLIDAE

Genus HAMINEA Leach

Haminea solitaria Say

Bulla insculpta Tott. DeKay, Nat. Hist. N. Y. 1843. p.14
Bulla insculpta Tott. Jay, Cat. 1852. p.113

Bulla insculpta Tott. Jay, Cat. 1852. p.470
Bulla solitaria Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:399
Haminea solitaria Say. Tryon, Man. Conch. 1893. 15:357

Order NUDIBRANCHIATA

Family AEOLIDAE

Subfamily AEOLINAE

Genus AEOLIS Cuvier

Aeolis salmonacea Couthouy

Cavolina salmonacea Couth. DeKay, Nat. Hist. N. Y. 1843. p.11
Aeolis salmonacea Couth. Gould, Invert. Mass. 1870. p.240

Class PULMONATA

Order STYLOMMATOPHORA

Suborder MONOTREMATA

Family VITRINIDAE

Genus VITRINA Draparnaud

Vitrina limpida Gould

Vitrina limpida Gld. Tryon, Am. Jour. Conch. 1866. 2:243
Vitrina limpida Gld. Aldrich, Troy List. 1867. p.6. (Lansingburg)
Vitrina limpida Gld. Binney, Smith. Misc. Coll. 194. 1869. 8:26. (Mohawk river)
Vitrina limpida Gld. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.130
Vitrina limpida Gld. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Pittsford)
Vitrina limpida Gld. Pilsbry, List Naut. 1898. p.25

Family ZONITIDAE

Genus OMPHALINA Rafinesque

Omphalina fuliginosa Griffith

Helix fuliginosa Griff. DeKay, Nat. Hist. N. Y. 1843. p.37. (Troy)
Hyalina fuliginosa Griff. Tryon, Am. Jour. Conch. 1866. 2:248
Helix fuliginosa Griff. Aldrich, Troy List. 1867. p.5. (Albany)
Zonites fuliginosa Griff. Binney, Smith. Misc. Coll. 194. 1869. 8:285
Omphalina fuliginosa Griff. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133

Zonites fuliginosus Griff. Beauchamp, Onondaga List. 1886. p.2
Zonites fuliginosa Griff. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Monroe county)
Omphalina fuliginosa Griff. Pilsbry, List Naut. 1898. p.24

Omphalina inornata Say

Helix inornata Say. DeKay, Nat. Hist. N. Y. 1843. p.39. (Orange county)
Hyalina inornata Say. Tryon, Am. Jour. Conch. 1866. 2:249
Zonites inornata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:289
Omphalina inornata Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133. (New Hartford)
Zonites inornatus Say. Beauchamp, Onondaga List. 1886. p.2
Zonites inornata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Pittsford)
Omphalina inornata Say. Pilsbry, List Naut. 1898. p.25

Genus VITREA Fitzinger

Vitrea cellaria Müller

Helix cellaria Müll. DeKay, Nat. Hist. N. Y. 1843. p.37
Hyalina cellaria Müll. Tryon, Am. Jour. Conch. 1866. 2:249
Hyalina cellaria Müll. Binney, Smith. Misc. Coll. 194. 1869. 8:30. (Long Island)
Helix cellaria Müll. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)
Omphalina cellaria Müll. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133
Vitrea cellaria Müll. Pilsbry, List Naut. 1898. p.25

Vitrea hammonis Ström.

Helix electrina Gld. DeKay, Nat. Hist. N. Y. 1843. p.30. (Lake George)
Hyalina electrina Gld. Tryon, Am. Jour. Conch. 1866. 2:251
Hyalina viridula Mke. Binney, Smith. Misc. Coll. 194. 1869. 8:34. (Mohawk river)
Helix viridula Mke. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)
Omphalina viridula Mke. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134
Zonites viridulus Mke. Beauchamp, Onondaga List. 1886. p.3

Zonites viridula Mke. Walton, Rochester Acad. Sci. Proc. 1892. 2:6
Vitrea hammonis Ström. Pilsbry, List Naut. 1898. p.25

Vitrea binneyana Morse

Helix binneyana Morse. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Huntington L. I.)
Vitrea binneyana Morse. Pilsbry, List Naut. 1898. p.26

Vitrea ferrea Morse

Hyalina ferrea Morse. Binney, Smith. Misc. Coll. 194. 1869. p.40
Omphalina ferrea Morse. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134
Vitrea ferrea Morse. Pilsbry, List Naut. 1898. p.26

Vitrea indentata Say

Helix indentata Say. DeKay, Nat. Hist. N. Y. 1843. p.31. (Troy)
Hyalina indentata Say. Tryon, Am. Jour. Conch. 1866. 2:246
Hyalina indentata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:35
Helix indentata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)
Omphalina indentata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134
Zonites indentatus Say. Beauchamp, Onondaga List. 1886. p.3
Zonites indentata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Monroe county)
Vitrea indentata Say. Pilsbry, List Naut. 1898. p.26

Genus ZONITOIDES Lehmann

Zonitoides nitidus Müller

Hyalina nitida Müll. Tryon, Am. Jour. Conch. 1866. 2:250
Hyalina nitida Müll. Binney, Smith. Misc. Coll. 194. 1869. 8:31. (Washington county)
Omphalina nitida Müll. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134. (Cherry Valley)
Zonites nitidus Müll. Beauchamp, Onondaga List. 1886. p.3
Zonites nitida Müll. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Monroe county)
Zonitoides nitidus Müll. Pilsbry, List Naut. 1898. p.27

Zonitoides arboreus Say

Helix arborea Say. DeKay, Nat. Hist. N. Y. 1843. p.30. (Rockland county)

Helix arborea Say. Jay, Cat. 1852. p.120

Hyalina arborea Say. Tryon, Am. Jour. Conch. 1866. 2:251

Helix arborea Say. Aldrich, Troy List. 1867. p.5. (Troy)

Hyalina arborea Say. Binney, Smith. Misc. Coll. 194. 1869. 8:33. (Mohawk river)

Helix arborea Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Omphalina arborea Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Zonites arboreus Say. Beauchamp, Onondaga List. 1886. p.3

Zonites arborea Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Pittsford)

Zonitoides arboreus Say. Pilsbry, List Naut. 1898. p.27

Zonitoides limatulus Ward

Pseudohyalina limatula Ward. Tryon, Am. Jour. Conch. 1866. 2:264

Hyalina limatula Ward. Binney, Smith. Misc. Coll. 194. 1869. 8:36

Zonites limatulus Ward. Beauchamp, Onondaga List. 1886. p.3

Zonitoides limatulus Ward. Pilsbry, List Naut. 1898. p.27

Zonitoides minusculus Binney

Pseudohyalina minuscula Binn. Tryon, Am. Jour. Conch. 1866. 2:264

Hyalina minuscula Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:37

Omphalina minuscula Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Zonites minusculus Binn. Beauchamp, Onondaga List. 1886. p.3

Zonites minuscula Binn. Walton, Rochester Acad. Sci. Proc. 1892. 2:6

Zonitoides minusculus Binn. Pilsbry, List Naut. 1898. p.27

Zonitoides exiguus Stimpson

Hyalina exigua St. Binney, Smith. Misc. Coll. 194. 1869. 8:42

Omphalina exignus St. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Zonitoides exiguus St. Pilsbry, List Naut. 1898. p.28

Zonitoides milium Morse

Zonitoides milium Morse. Pilsbry, List Naut. 1898. p.28

Genus EUCONULUS Reinhardt

Euconulus fulvus Müller

Helix fulva Drap. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Conulus fulvus Müll. Pilsbry, List Naut. 1898. p.27

Euconulus chersinus Say

Helix chersina Say. DeKay, Nat. Hist. N. Y. 1843. p.44

Conulus chersina Say. Tryon, Am. Jour. Conch. 1866. 2:256

Helix chersina Say. Aldrich, Troy List. 1867. p.5. (Mohawk)

Helix chersina Say. Binney, Smith Misc. Coll. 194. 1869. 8:46

Zonites chersina Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Pittsford)

Genus GASTRODONTA Albers

Gastrodonta intertexta Binney

Helix intertexta Binn. DeKay, Nat. Hist. N. Y. 1843. p.38. (Ontario county)

Mesomphix intertexta Binn. Tryon, Am. Jour. Conch. 1866. 2:254

Hyalina intertexta Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:44. (Sharon Springs)

Zonites intertextus Binn. Beauchamp, Onondaga List. 1886. p.3

Zonites intertexta Binn. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Monroe county)

Gastrodonta intertexta Binn. Pilsbry, List Naut. 1898. p.28

Gastrodonta ligera Say

Helix ligera Say. DeKay, Nat. Hist. N. Y. 1843. p.40. (Ontario county)

Mesomphix ligera Say. Tryon, Am. Jour. Conch. 1866. 2:255

Hyalina ligera Say. Binney, Smith. Misc. Coll. 194. 1869. 8:44

Omphalina ligera Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133. (Erie county)

Zonites ligerus Say. Beauchamp, Onondaga List. 1886. p.3

Gastrodonta ligera Say. Pilsbry, List Naut. 1898. p.28

Gastrodonta suppressa Say

Helix suppressa Say. DeKay, Nat. Hist. N. Y. 1843. p.38

Zonites suppressa Say. Binney, Smith. Misc. Coll. 194. 1869. 8:293

Helix suppressa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Ventridens suppressa Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Zonites suppressa Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Monroe county)

Gastrodonta suppressa Say. Pilsbry, List Naut. 1898. p.28

Gastrodonta multidentata Binney

Gastrodonta multidentata Binn. Tryon, Am. Jour. Conch. 1866. 2:258

Helix multidentata Binn. Aldrich, Troy List. 1867. p.5. (Albany)

Hyalina multidentata Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:50

Ventridens multidentata Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Zonites multidentatus Binn. Beauchamp, Onondaga List. 1886. p.3

Zonites multidentata Binn. Walton, Rochester Acad. Sci. Proc. 1892. 2:6. (Monroe county)

Gastrodonta multidentata Binn. Pilsbry, List Naut. 1898. p.29

Genus PUNCTUM Morse

Punctum pygmaeum Draparnaud

Conulus minutissima Lea. Tryon, Am. Jour. Conch. 1866. 2:257

Punctum minutissimum Lea. Binney, Smith. Misc. Coll. 194. 1869. 8:222

Helix minutissima Lea. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Huntington)

Punctum minutissimum Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132

Punctum pygmaeum Drap. Pilsbry, List Naut. 1898. p.33

Genus SPHYRADIUM Charp

Sphyradium edentulum Draparnaud

Pupa simplex Gld. DeKay, Nat. Hist. N. Y. 1843. p.52
Vertigo simplex Gld. Tryon, Am. Jour. Conch. 1867. 3:310
Vertigo simplex Gld. Binney, Smith. Misc. Coll. 194. 1869. 8:254
Vertigo simplex Gld. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)
Isthmia simplex Gld. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133
Vertigo simplex Gld. Beauchamp, Onondaga List. 1886. p.2
Pupa simplex Gld. Walton, Rochester Acad. Sci. Proc. 1892. 2:10
Sphyradium edentulum Drap. Pilsbry, List Naut. 1898. p.33

Family HELICIDAE

Genus PYRAMIDULA Fitzinger

Pyramidula alternata Say

Helix alternata Say. DeKay, Nat. Hist. N. Y. 1843. p.29
Helix alternata Say. Jay, Cat. 1852. p.119
Helix radiata Gmel. Jay, Cat. 1852. p.169
Helix scabra Lam. Jay, Cat. 1852. p.173
Anguispira alternata Say. Tryon, Jour. Conch. 1866. 2:261
Helix alternata Say. Aldrich, Troy List. 1867. p.5
Helix alternata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:73
Patula alternata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix alternata Say. Beauchamp, Onondaga List. 1886. p.1
Patula alternata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)
Pyramidula alternata Say. Pilsbry, List Naut. 1898. p.31

Pyramidula striatella Anthony

Helix striatella Anth. DeKay, Nat. Hist. N. Y. 1843. p.43. (Oriskany)
Patula striatella Anth. Tryon, Am. Jour. Conch. 1866. 2:262
Helix striatella Anth. Aldrich, Troy List. 1867. p.6. (Islands in Hudson)
Helix striatella Anth. Binney, Smith. Misc. Coll. 194. 1869. 8:80. (Mohawk)
Patula striatella Anth. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Helix striatella Anth. Beauchamp, Onondaga List. 1886. p.1
Patula striatella Anth. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)
Pyramidula striatella Anth. Pilsbry, List Naut. 1898. p.32

Pyramidula solitaria Say

Helix solitaria Say. DeKay, Nat. Hist. N. Y. 1843. p.43
Helix solitaria Say. Binney, Smith. Misc. Coll. 194. 1869. 8:71
Patula solitaria Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131. (Western New York)
Pyramidula solitaria Say. Pilsbry, List Naut. 1898. p.31

Pyramidula perspectiva Say

Helix perspectiva Say. DeKay, Nat. Hist. N. Y. 1843. p.42. (Lake Erie)
Helix perspectiva Say. Jay, Cat. 1852. p.163
Helix perspectiva Say. Say, Conch. U. S. ed. by Binney. 1858. p.9. (Lake Erie)
Patula perspectiva Say. Tryon, Am. Jour. Conch. 1866. 2:262
Helix perspectiva Say. Binney, Smith. Misc. Coll. 194. 1869. 8:79
Patula perspectiva Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix perspectiva Say. Beauchamp, Onondaga List. 1886. p.1
Patula perspectiva Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)
Pyramidula perspectiva Say. Pilsbry, List Naut. 1898. p.32

Genus ACANTHINULA Beck

Acanthinula harpa Say

Zoogenites harpa Say. Tryon, Am. Jour. Conch. 1867. 3:311
Acanthinula harpa Say. Pilsbry, List Naut. 1898. p.7

Genus HELICODISCUS Morse

Helicodiscus lineatus Say

Helix lineata Say. DeKay, Nat. Hist. N. Y. 1843. p.44. (Troy)
Helix lineata Say. Jay, Cat. 1852. p.151
Helicodiscus lineata Say. Tryon, Am. Jour. Conch. 1866. 2:264
Helix lineata Say. Aldrich, Troy List. 1867. p.5. (Albany)
Hyalina lineata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:52
Helix lineata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Helicodiscus lineatus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.130

Helicodiscus lineatus Mse. Beauchamp, Onondaga List. 1886. p.1

Helicodiscus lineatus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)

Helicodiscus lineatus Say. Pilsbry, List Naut. 1898. p.33

Genus POLYGYRA Say

Polygyra tridentata Say

Helix tridentata Say. DeKay, Nat. Hist. N. Y. 1843. p.28

Helix tridentata Say. Jay, Cat. 1852. p.181

Helix tridentata Say. Aldrich, Troy List. 1867. p.6

Triodopsis tridentata Say. Tryon, Am. Jour. Conch. 1867. 3:50

Helix tridentata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:129

Helix tridentata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Staten Island)

Triodopsis tridentata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Helix tridentata Say. Beauchamp, Onondaga List. 1886. p.1

Triodopsis tridentata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)

Polygyra tridentata Say. Pilsbry, List Naut. 1898. p.10

Polygyra tridentata juxtidens Pilsbry

Polygyra juxtidens Pils. Pilsbry, List Naut. 1898. p.10. (Southern New York)

Polygyra fraudulenta Pilsbry

Helix fallax Say. DeKay, Nat. Hist. N. Y. 1843. p.28

Helix fallax Say. Jay, Cat. 1852. p.138

Triodopsis fallax Say. Tryon, Am. Jour. Conch. 1867. 3:51

Helix fallax Say. Binney, Smith. Misc. Coll. 194. 1869. 8:131

Triodopsis fallax Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Triodopsis fallax Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)

Polygyra fraudulenta Pils. Pilsbry, List Naut. 1898. p.10

Polygyra inflecta Say

Isognomostoma inflecta Say. Tryon, Am. Jour. Conch. 1867. 3:54

Helix inflecta Say. Binney, Smith. Misc. Coll. 194. 1869. 8:128
Polygyra inflecta Say. Pilsbry, List Naut. 1898. p.11.

Polygyra profunda Say

Helix profunda Say. DeKay, Nat. Hist. N. Y. 1843. p.42
Ulostoma profunda Say. Tryon, Am. Jour. Conch. 1867. 3:37
Helix profunda Say. Binney, Smith. Misc. Coll. 194. 1869. 8:152
Mesodon profunda Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Polygyra profunda Say. Pilsbry, List Naut. 1898. p.11. (Western New York)

Polygyra sayi Binney

Helix diodonta Say. DeKay, Nat. Hist. N. Y. 1843. p 34
Helix diodonta Say. Binney ed. Say. 1858. p.30
Mesodon diodonta Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Helix sayii Binn. Beauchamp, Onondaga List. 1886. p.2
Mesodon sayii Binn. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Pittsford)
Polygyra sayii Binn. Pilsbry, List Naut. 1898. p.12

Polygyra albolabris Say

Helix albolabris Say. DeKay, Nat. Hist. N. Y. 1843. p.26
Helix rufa DeK. DeKay, Nat. Hist. N. Y. 1843. p.44. (Orange county)
Helix albolabris Say. Jay, Cat. 1852. p.119
Helix albolabris Say. Aldrich, Troy List. 1867. p.5. (Bald mountain)
Mesodon albolabris Say. Tryon, Am. Jour. Conch. 1867. 3:39
Helix albolabris Say. Binney, Smith. Misc. Coll. 194. 1869. 8:136
Helix albolabris Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)
Mesodon albolabris Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix albolabris Say. Beauchamp, Onondaga List. 1886. p.2
Mesodon albolabris Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)
Polygyra albolabris Say. Pilsbry, List Naut. 1898. p.12

Polygyra albolabris dentata Walker

Mesodon albolabris dentate var. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Mesodon albolabris var. dentata Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Pittsford)

Polygyra exoleta Binney

Helix exoleta Binn. DeKay, Nat. Hist. N. Y. 1843. p.27. (Rockland county)

Helix zaleta Say. Jay, Cat. 1852. p.186

Helix exoleta Binn. Aldrich, Troy List. 1867. p.5. (Near Albany)

Mesodon exoleta Binn. Tryon, Am. Jour. Conch. 1867. 3:39

Helix exoleta Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:144

Mesodon exoleta Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Polygyra exoleta Binn. Pilsbry, List Naut. 1898. p.12. (Western New York)

Polygyra multilineata Say

Helix multilineata Say. DeKay, Nat. Hist. N. Y. 1843. p.41. (Western New York)

Helix multilineata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:139

Mesodon multilineata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Polygyra multilineata Say. Pilsbry, List Naut. 1898. p.12. (Western New York)

Polygyra dentifera Binney

Helix dentifera Binn. DeKay, Nat. Hist. N. Y. 1843. p.34

Mesodon dentifera Binn. Tryon, Am. Jour. Conch. 1867. 3:39

Helix dentifera Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:145

Mesodon dentifera Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131. (Buffalo)

Polygyra dentifera Binn. Pilsbry, List Naut. 1898. p.12

Polygyra palliata Say

Helix palliata Say. DeKay, Nat. Hist. N. Y. 1843. p.33. (Niagara)

Helix palliata Say. Jay, Cat. 1852. p.161

Helix caroliniensis Lea. Jay, Cat. 1852. p.127

Helix palliata Say. Say, Conch. U. S. ed. by Binney. 1858. p.16. (Niagara)
Xolotrema palliata Say. Tryon, Am. Jour. Conch. 1867. 3:49
Helix palliata Say. Aldrich, Troy List. 1867. p.5. (Near Troy)
Helix palliata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:123
Triodopsis palliata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix palliata Say. Beauchamp, Onondaga List. 1886. p.1
Triodopsis palliata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Pittsford)
Polygyra palliata Say. Pilsbry, List Naut. 1898. p.13

Polygyra appressa Say

Helix appressa Say. DeKay, Nat. Hist. N. Y. 1843. p.27
Helix appressa Say. Jay, Cat. 1852. p.120
Helix appressa Say. Say, Conch. U. S. ed. by Binney. 1858. p.15. (Niagara falls)
Xolotrema appressa Say. Tyron, Am. Jour. Conch. 1867. 3:50
Helix appressa Say. Binney, Smith. Misc. Coll. 194. 1869. 8:126
Polygyra appressa Say. Pilsbry, List Naut. 1898. p.13

Polygyra elevata Say

Helix elevata Say. DeKay, Nat. Hist. N. Y. 1843. p.36
Xolotrema elevata Say. Tryon, Am. Jour. Conch. 1867. 3:48
Helix elevata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:142
Mesodon elevata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Polygyra elevata Say. Pilsbry, List Naut. 1898. p 13

Polygyra pennsylvanica Green

Helix pennsylvanica Green. DeKay, Nat. Hist. N. Y. 1843. p.41
Helix pennsylvanica Green. Binney, Smith. Misc. Coll. 194. 1869. 8:140
Polygyra pennsylvanica Green. Pilsbry, List Naut. 1898. p.13

Polygyra thyroides Say

Helix thyroidus Say. DeKay, Nat. Hist. N. Y. 1843. p.29
Helix thyroides Say. Jay, Cat. 1852. p.180
Helix thyroidus Say. Say, Conch. U. S. ed. by Binney. 1858. p.31. (Niagara falls)

Helix thyroidus Say. Aldrich, Troy List. 1867. p.6. (Near Bald mountain)
Mesodon thyroides Say. Tryon, Am. Jour. Conch. 1867. 3:41
Mesodon bucculenta Gld. Tryon, Am. Jour. Conch. 1867. 3:41
Helix thyroides Say. Binney, Smith. Misc Coll. 194. 1869. 8:147
Helix thyroides Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)
Mesodon thyroides Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix thyroides Say. Beauchamp, Onondaga List. 1886. p.2
Mesodon thyroides Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)
Polygyra thyroides Say. Pilsbry, List Naut. 1898. p.13

Polygyra clausa Say

Helix clausa Say. DeKay, Nat. Hist. N. Y. 1843. p.31
Helix clausa Say. Binney, Smith. Misc. Coll. 194. 1869. 8:149
Polygyra clausa Say. Pilsbry, List Naut. 1898. p 13

Polygyra hirsuta Say

Helix hirsuta Say. DeKay, Nat. Hist. N. Y. 1843. p.36
Helix hirsuta Say. Jay, Cat. 1852. p.144
Stenotrema hirsuta Say. Tryon, Am. Jour. Conch. 1867. 3:57
Helix hirsuta Say. Binney, Smith. Misc. Coll. 194. 1869. 8:118
Helix hirsuta Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)
Stenotrema hirsuta Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131. (New Hartford)
Stenotrema hirsuta Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)
Polygyra hirsuta Say. Pilsbry, List Naut. 1898. p.14

Polygyra monodon Racket

Helix monodon Rack. DeKay, Nat. Hist. N. Y. 1843. p.35. (Troy)
Helix monodon Rack. Aldrich, Troy List. 1867. p.5. (Troy)
Stenotrema monodon Rack. Tryon, Am. Jour. Conch. 1867. 3:56
Helix monodon Rack. Binney, Smith. Misc. Coll. 194. 1869. 8:120

Helix monodon Rack. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Stenotrema monodon Rack. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Helix monodon Rack. Beauchamp, Onondaga List. 1886. p.1

Stenotrema monodon Rack. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)

Polygyra monodon Rack. Pilsbry, List Naut. 1898. p.14

Polygyra monodon fraterna Say

Helix fraterna Say. Jay, Cat. 1852. p.140

Stenotrema monodon var. fraterna Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)

Polygyra monodon fraterna Say. Pilsbry, List Naut. 1898. p.15

Polygyra leai Ward

Stenotrema monodon var. leaii Ward. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Rochester)

Genus VALLONIA Risso

Vallonia pulchella Müller

Helix minuta Say. DeKay, Nat. Hist. N. Y. 1843. p.40. (Essex county)

Vallonia minuta Say. Tryon, Am. Jour. Conch. 1867. 3:36

Helix minuta Say. Aldrich, Troy List. 1867. p.5. (Mohawk flats)

Helix pulchella Müll. Binney, Smith. Misc. Coll. 194. 1869. p.157

Helix pulchella Müll. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Vallonia pulchella Müll. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132

Helix pulchella Müll. Beauchamp, Onondaga List. 1886. p.2

Vallonia pulchella Müll. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (Pittsford)

Vallonia pulchella Müll. Pilsbry, List Naut. 1898. p.7

Vallonia excentrica Sterki

Vallonia excentrica Stk. Pilsbry, List Naut. 1898. p.7

Vallonia costata Müller

Vallonia costata Müll. Pilsbry, List Naut. 1898. p.7

Genus CIRCINARIA Beck

Circinaria concava Say

Helix concava Say. DeKay, Nat. Hist. N. Y. 1843. p.33
Macrocyclis concava Say. Tryon, Am. Jour. Conch. 1866. 2:245
Helix concava Say. Aldrich, Troy List. 1867. p.5. (Lansingburg)
Macrocyclis concava Say. Binney, Smith. Misc. Coll. 194. 1869. 8:56
Macrocyclis concava Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Macrocyclis concava Say. Beauchamp, Onondaga List. 1886. p.1
Macrocyclis concava Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:5. (Pittsford)
Circinaria concava Say. Pilsbry, List Naut. 1898. p.24

Genus HELIX Linnaeus

Helix hortensis Müller

Helix subglobosa Binn. DeKay, Nat. Hist. N. Y. 1843. p.32
Helix hortensis Müll. Smith & Prime, An. Lyc. N. Y. 1870. 9:404
Tachea hortensis Müll. Walton, Rochester Acad. Sci. Proc. 1892. 2:7. (East Rochester)

Family PUPIDAE

Genus PUPOIDES Pfeiffer

Pupoides marginatus Say

Pupa fallax Say. DeKay, Nat. Hist. N. Y. 1843. p.51
Pupa fallax Say. Jay, Cat. 1852. p 226
Leucochila fallax Say. Tryon, Am. Jour. Conch. 1867. 3:305
Pupa fallax Say. Binney, Smith. Misc. Coll. 194. 1869. 8:239
Pupa fallax Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)
Leucochila fallax Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132. (Crown Point)
Pupa fallax Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Rochester)
Leucochila fallax Say. Pilsbry, List Naut. 1898. p.19
Pupoides marginatus Say. Pilsbry, A. N. S. P. Proc. 1900. p.605

Genus PUPA Lamarck

Pupa muscorum Linnaeus

Pupa badia Ads. DeKay, Nat. Hist. N. Y. 1843. p.49. (Crown Point)

Pupa muscorum Linn. Jay, Cat. 1852. p.229

Pupilla badia Ads. Tryon, Am. Jour. Conch. 1867. 3:302

Pupa muscorum Linn. Binney, Smith. Misc. Coll. 194. 1869. 8:234. (Isles of St Lawrence)

Pupilla muscorum Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132. (Crown Point)

Pupa muscorum Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Brighton)

Pupa muscorum Linn. Pilsbry, List Naut. 1898. p.20

Pupa muscorum Linn. Pilsbry, A. N. S. P. Proc. 1900. p.605

Genus VERTIGO Müller

Vertigo ovata Say

Pupa ovata Say. DeKay, Nat. Hist. N. Y. 1843. p.50

Pupa ovata Say. Jay, Cat. 1852. p.230

Vertigo ovata Say. Aldrich, Troy List. 1867. p.6. (Troy)

Vertigo ovata Say. Tryon, Am. Jour. Conch. 1867. 3:310

Vertigo ovata Say. Binney, Smith. Misc. Coll. 194. 1869. 8:252

Vertigo ovata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)

Isthmia ovata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133

Vertigo ovata Say. Beauchamp, Onondaga List. 1886. p.2

Vertigo ovata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:11

Vertigo ovata Say. Pilsbry, List Naut. 1898. p.22

Vertigo ovata Say. Pilsbry, A. N. S. P. Proc. 1900. p.608

Vertigo binneyana Sterki

Vertigo binneyana Stk. Pilsbry, List Naut. 1898. p.21

Vertigo binneyana Stk. Pilsbry, A. N. S. P. Proc. 1900. p.608

Vertigo pygmaea Draparnaud

Vertigo pygmaea Drap. Pilsbry, List Naut. 1898. p.22

Vertigo pygmaea Drap. Pilsbry, A. N. S. P. Proc. 1900. p.608

Vertigo tridentata Wolf

Vertigo tridentata Wolf. Pilsbry, List Naut. 1898. p.22

Vertigo tridentata Wolf. Pilsbry, A. N. S. P. Proc. 1900. p.608

Vertigo ventricosa Morse

Vertigo ventricosa Morse. Tryon, Am. Jour. Conch. 1867. 3:310. (Mohawk)

Vertigo ventricosa Morse. Binney, Smith. Misc. Coll. 194. 1869. 8:253

Isthmia ventricosa Morse. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133

Vertigo ventricosa Morse. Beauchamp, Onondaga List. 1886. p.2

Vertigo ventricosa Morse. Pilsbry, List Naut. 1898. p.22

Vertigo ventricosa Morse. Pilsbry, A. N. S. P. Proc. 1900. p.609

Vertigo gouldi Binney

Pupa gouldii Binn. Jay, Cat. 1852. p.227

Vertigo gouldii Binn. Tryon, Am. Jour. Conch. 1867. 3:309

Vertigo gouldii Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:249

Isthmia gouldii Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132

Vertigo gouldii Binn. Pilsbry, List Naut. 1898. p.22

Vertigo gouldii Binn. Pilsbry, A. N. S. P. Proc. 1900. p.609

Vertigo gouldi bollesiana Morse

Vertigo bollesiana Morse. Tryon, Am. Jour. Conch. 1867. 3:308

Vertigo bollesiana Morse. Binney, Smith. Misc. Coll. 194. 1869. 8:250

Isthmia bollesiana Morse. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132

Vertigo bollesiana Morse. Beauchamp, Onondaga List. 1886. p.2

Vertigo bollesiana Morse. Pilsbry, List Naut. 1898. p.22

Vertigo gouldii bollesiana Morse. Pilsbry, A. N. S. P. Proc. 1900. p.609

Vertigo modesta Say

Pupa modesta Say. Jay, Cat. 1852. p.229

Vertigo modesta Say. Pilsbry, A. N. S. P. Proc. 1900. p.609

Vertigo milium Gould

Pupa milium Gld. DeKay, Nat. Hist. N. Y. 1843. p.48

Vertigo milium Gld. Tryon, Am. Jour. Conch. 1867. 3:309

Vertigo milium Gld. Binney, Smith. Misc. Coll. 194. 1869. 8:251
Vertigo milium Gld. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)
Isthmia milium Gld. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133
Pupa milium Gld. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Monroe county)
Vertigo milium Gld. Pilsbry, List Naut. 1898. p.21
Vertigo milium Gld. Pilsbry, A. N. S. P. Proc. 1900. p.610

Genus COCHLICOPA Risso

Cochlicopa lubrica Müller

Bulimus lubricus Brug. DeKay, Nat. Hist. N. Y. 1843. p.55. (Oriskany, Oneida county)
Zua subcylindrica Chem. Tryon, Am. Jour. Conch. 1867. 3:299
Achatina lubrica Müll. Aldrich, Troy List. 1867. p.6. (Mohawk basin)
Cionella subcylindrica Linn. Binney, Smith. Misc. Coll. 194. 1869. 8:224
Zua subcylindrica Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Cionella subcylindrica Linn. Beauchamp, Onondaga List. 1886. p.2
Ferussacia subcylindrica Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Monroe county)
Cochlicopa lubrica Müll. Pilsbry, List Naut. 1898. p.23

Genus BIFIDARIA Sterki

Bifidaria corticaria Say

Pupa corticaria Say. DeKay, Nat. Hist. N. Y. 1843. p.50
Leucochila corticaria Say. Tryon, Am. Jour. Conch. 1867. 3:307
Pupa corticaria Say. Binney, Smith. Misc. Coll. 194. 1869. 8:244
Pupa corticaria Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Huntington)
Leucochila corticaria Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Pupa corticaria Say. Beauchamp, Onondaga List. 1886. p.2
Pupa corticaria Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Pittsford)

Bifidaria corticaria Say. Pilsbry, List Naut. 1898. p.19
Bifidaria corticaria Say. Pilsbry, A. N. S. P. Proc. 1900. p.606

Bifidaria rupicola Say

Pupa rupicola Say. Binney, Smith. Misc. Coll. 194. 1869. 8:243
Leucochila rupicola Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Pupa rupicola Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Pittsford)
Bifidaria rupicola Say. Pilsbry, List Naut. 1898. p.19
Bifidaria rupicola Say. Pilsbry, A. N. S. P. Proc. 1900. p.607

Bifidaria contracta Say

Pupa contracta Say. DeKay, Nat. Hist. N. Y. 1843. p.49. (Troy)
Pupa contracta Say. Jay, Cat. 1852. p.224
Leucochila contracta Say. Tryon, Am. Jour. Conch. 1867. 3:307
Pupa contracta Say. Binney, Smith. Misc. Coll. 194. 1869. 8:242. (Mohawk)
Pupa contracta Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Huntington)
Leucochila contracta Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p 132
Pupa contracta Say. Beauchamp, Onondaga List. 1886. p.2
Pupa contracta Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Monroe county)
Bifidaria contracta Say. Pilsbry, List Naut. 1898. p.19
Bifidaria contracta Say. Pilsbry, A. N. S. P. Proc. 1900. p.607

Bifidaria armifera Say

Pupa armifera Say. DeKay, Nat. Hist. N. Y. 1843. p.52. (Crown Point)
Leucochila armifera Say. Tryon, Am. Jour. Conch. 1867. 3:306
Pupa armifera Say. Binney, Smith. Misc. Coll. 194. 1869. 8:241
Pupa armifera Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)
Leucochila armifera Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132

Pupa armifera Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Rochester).
Bifidaria armifera Say. Pilsbry, List Naut. 1898. p.19
Bifidaria armifera Say. Pilsbry, A. N. S. P. Proc. 1900. p.607

Bifidaria pentodon Say

Pupa pentodon Say. DeKay, Nat. Hist. N. Y. 1843. p.50. (Albany)
Pupa pentodon Say. Jay, Cat. 1852. p.230
Pupilla pentodon Say. Tryon, Am. Jour. Conch. 1867. 3:303
Pupa pentodon Say. Binney, Smith. Misc. Coll. 194. 1869. 8:236
Pupa pentodon Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)
Pupilla pentodon Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.132
Pupa pentodon Say. Beauchamp, Onondaga List. 1886. p.2
Pupa pentodon Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:10. (Rochester)
Bifidaria pentodon Say. Pilsbry, List Naut. 1898. p 20
Bifidaria pentodon Say. Pilsbry, A. N. S P. Proc. 1900. p.608

Bifidaria curvidens Gould

Bifidaria curvidens Gld. Pilsbry, List Naut. 1898. p.20
Bifidaria curvidens Gld. Pilsbry, A. N. S. P. Proc. 1900. p.608

Genus STROBILOPS Pilsbry

Strobilops labyrinthica Say

Helix labyrinthica Say. DeKay, Nat. Hist. N. Y. 1843. p.39. (Troy)
Helix labyrinthica Say. Jay, Cat. 1852. p.148
Strobila labyrinthica Say. Tryon, Am. Jour. Conch. 1866. 2:259
Helix labyrinthica Say. Binney, Smith. Misc. Coll. 194. 1869. 8:84
Helix labyrinthica Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Greenport)
Strobila labyrinthica Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Helix labyrinthica Say. Beauchamp, Onondaga List. 1886. p.1
Strobila labyrinthica Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Pittsford)
Strobilops labyrinthica Say. Pilsbry, List Naut. 1898. p.18

Strobilops virgo Pilsbry

Strobilops virgo Pils. Pilsbry, List Naut. 1898. p.19

Strobilops affinis Pilsbry

Strobilops affinis Pils. Pilsbry, List Naut. 1898. p.19

Family LIMACIDAE

Genus LIMAX Linnaeus

Limax maximus Linnaeus

Limax maximus Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Limax maximus Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)

Limax maximus Linn. Pilsbry, List Naut. 1898. p.29. (Lockport. Mr E. P. VanDuzee)

Limax flavus Linnaeus

Limax flavus Linn. DeKay, Nat. Hist. N. Y. 1843. p.21. (New York city)

Limax flavus Linn. Tryon, Am. Jour. Conch. 1867. 3:314

Limax flavus Linn. Binney, Smith. Misc. Coll. 194. 1869. 8:61

Limax flavus Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Eulimax flavus Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Limax flavus Linn. Beauchamp, Onondaga List. 1886. p.1

Limax flavus Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)

Limax flavus Linn. Pilsbry, List Naut. 1898. p.29

Family TEBENNOPHORIDAE

Genus PHILOMYCUS (Raf.) Ferussac

Philomycus carolinensis Bosc

Tebennophorus carolinensis Bosc. DeKay, Nat. Hist. N. Y. 1843. p.24

Tebennophorus carolinensis Bosc. Tryon, Am. Jour. Conch. 1867. 3:316

Tebennophorus carolinensis Bosc. Binney, Smith. Misc. Coll. 194. 1869. 8:297

Tebennophorus carolinensis Binn. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)

Tebennophorus carolinensis Bosc. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Tebennophorus carolinensis Bosc. Beauchamp, Onondaga List. 1886. p.3

Tebennophorus carolinensis Bosc. Walton, Rochester Acad. Sci. Proc. 1892. 2:8

Philomycus carolinensis Bosc. Pilsbry, List Naut. 1898. p.29, 31

Philomycus dorsalis Binney

Tebennophorus dorsalis Binn. Tryon, Am. Jour. Conch. 1867. 3:317

Tebennophorus dorsalis Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:300

Tebennophorus dorsalis Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Tebennophorus dorsalis Binn. Beauchamp, Onondaga List. 1886. p.3

Tebennophorus dorsalis Binn. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)

Philomycus dorsalis Binn. Pilsbry, List Naut. 1898. p.31

Family ARIONIDAE

Genus ARION Ferussac

Arion hortensis Ferussac

Arion hortensis Fer. DeKay, Nat. Hist. N. Y. 1843. p.23

Arion hortensis Fer. Pilsbry, A. N. S. P. Proc. 1898. p.239. (Poughkeepsie)

Arion hortensis Fer. Pilsbry, List Naut. 1898. p.29. (Poughkeepsie)

Genus AGRIOLIMAX Mörch

Agriolimax agrestis Linnaeus

Limax agrestis Linn. DeKay, Nat. Hist. N. Y. 1843. p.20

Limax agrestis Müll. Tryon, Am. Jour. Conch. 1867. 3:315

Limax agrestis Linn. Binney, Smith. Misc. Coll. 194. 1869. 8:63

Limax agrestis Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)

Eulimax agrestis Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131

Limax agrestis Linn. Beauchamp, Onondaga List. 1886. p.1

Limax agrestis Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)

Agriolimax agrestis Linn. Pilsbry, List Naut. 1898. p.29

Agriolimax campestris Binney

Limax campestris Binn. DeKay, Nat. Hist. N. Y. 1843. p.22
Limax campestris Binn. Binney, Smith. Misc. Coll. 194. 1869. 8:65
Limax campestris Binn. Smith & Prime, An. Lyc. N. Y. 1870. 9:403. (Long Island)
Eulimax campestris Binn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.131
Limax campestris Binn. Beauchamp, Onondaga List. 1886. p.1
Limax campestris Walton. Walton, Rochester Acad. Sci. Proc. 1892. 2:8. (Monroe county)
Agriolimax campestris Binn. Pilsbry, List Naut. 1898. p.29

Family SUCCINEIDAE

Genus SUCCINEA Draparnaud

Succinea retusa Lea

Succinea ovalis Say. DeKay, Nat. Hist. N. Y. 1843. p.53
Helix ovalis Say. Jay, Cat. 1852. p.161
Succinea ovalis Say. Jay, Cat. 1852. p.250
Succinea ovalis Say. Tryon, Am. Jour. Conch. 1866. 2:237
Succinea ovalis Say. Aldrich, Troy List. 1867. p.5
Succinea ovalis Gld. Binney, Smith. Misc. Coll. 194. 1869. 8:257
Succinea ovalis Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380
Succinea ovalis Gld. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p 133
Succinea ovalis Gld. Beauchamp, Onondaga List. 1886. p.2
Succinea ovalis Gld. Walton, Rochester Acad. Sci. Proc. 1892. 2:11
Succinea retusa Lea. Pilsbry, List Naut. 1898. p.34

Succinea obliqua Say

Succinea obliqua Say. DeKay, Nat. Hist. N. Y. 1843. p.53. (Herkimer county)
Succinea obliqua Say. Jay, Cat. 1852. p.473
Succinea obliqua Say. Tryon, Am. Jour. Conch. 1866. 2:232
Succinea obliqua Say. Aldrich, Troy List. 1867. p.5. (Albany)
Succinea obliqua Say. Binney, Smith. Misc. Coll. 194. 1869. 8:265. (Mohawk)
Succinea obliqua Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133

Succinea obliqua Say. Beauchamp, Onondaga List. 1886. p.2
Succinea obliqua Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Monroe county)
Succinea obliqua Say. Pilsbry, List Naut. 1898. p.34

Succinea obliqua totteniana Lea

Succinea totteniana Lea. Tryon, Am. Jour. Conch. 1866. 2:230
Succinea totteniana Lea. Aldrich, Troy List. 1867. p.5
Succinea totteniana Lea. Binney, Smith. Misc. Coll. 194. 1869. 8:266
Succinea totteniana Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133
Succinea totteniana Lea. Beauchamp, Onondaga List. 1886. p.2
Succinea totteniana Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Monroe county)
Succinea obliqua totteniana Lea. Pilsbry, List Naut. 1898. p.34

Succinea avara Say

Succinea avara Say. DeKay, Nat. Hist. N. Y. 1843. p.54. (Near Lake Champlain)
Succinea avara Say. Jay, Cat. 1852. p.250
Succinea avara Say. Tryon, Am. Jour. Conch. 1866. 2:233
Succinea avara Say. Binney, Smith. Misc. Coll. 194. 1869. 8:262. (Mohawk river)
Succinea avara Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:404. (Long Island)
Succinea avara Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133
Succinea avara Say. Beauchamp, Onondaga List. 1886. p.2. (Seneca river)
Succinea avara Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Monroe county)
Succinea avara Say. Pilsbry, List Naut. 1898. p.34

Succinea aurea Lea

Succinea aurea Lea. Tryon, Am. Jour. Conch. 1866. 2:241. (Niagara falls)
Succinea aurea Lea. Binney, Smith. Misc. Coll. 194. 1869. 8:264
Succinea aurea Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.133. (Little Lakes)

Succinea aurea Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Monroe county)

Succinea aurea Lea. Pilsbry, List Naut. 1898. p.34

Order BASOMMATOPHORA

Suborder GEHYDROPHILA

Family AURICULIDAE

Genus ALEXIA Leach

Alexia myosotis Draparnaud

Auricula denticulata Mont. DeKay, Nat. Hist N. Y. 1843. p.58

Alexia myosotis Drap. Binney, Smith. Misc. Coll. 143. 1865. 7:4. (Long Island sound)

Melampus denticulatus St. Smith & Prime, An. Lyc. N. Y. 1870. 9:399

Alexia myosotis Drap. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Genus MELAMPUS Montfort

Melampus lineatus Say

Auricula bidentata Say. DeKay, Nat. Hist. N. Y. 1843. p.57

Auricula bidentata Say. Jay, Cat. 1852. p.264

Auricula cornea Desh. Jay, Cat. 1852. p.264

Melampus bidentatus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:10

Melampus lineatus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:12

Melampus corneus St. Smith & Prime, An. Lyc. N. Y. 1870. 9:399

Melampus bidentatus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.134

Suborder HYGROPHILA

Family LIMNAEIDAE

Subfamily LIMNAEINAE

Limnaea stagnalis Linnaeus

Limnea jugularis Say. DeKay, Nat. Hist. N. Y. 1843. p.74. (Lakes Champlain and Onondaga)

Limnea appressa Say. DeKay, Nat. Hist. N. Y. 1843. p 74. (Lakes Champlain and Cayuga)

Limnaea appressa Say. Stimpson, New Eng. Shells. 1851. p.52. (Lake Champlain)

Lymnaea jugularis Say. Jay. Cat. 1852. p.269

Limnaea stagnalis Linn. Binney, Smith. Misc. Coll. 143. 1865. 7:25. (Black river)

Limnaea stagnalis Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea stagnalis Linn. Beauchamp, Onondaga List. 1886. p.3. (Oneida lake)

Limnaea stagnalis Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:11. (Brighton)

Limnaea ampla Mighels

Limnaea ampla Migh. Binney, Smith. Misc. Coll. 143. 1865. 7:30

Limnaea ampla Migh. Aldrich, Troy List. 1867. p.3. (Dry river)

Radix ampla Migh. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea auricularia Linnaeus

Limnaea auricularia Linn. Call, Naut. 1902. 16:58. (Flatbush)

Limnaea columella Say

Limnea columella Say. DeKay, Nat. Hist. N. Y. 1843. p.72

Lymnaea columella Say. Jay, Cat. 1852. p 269. (Cayuga lake)

Lymnaea macrostoma Say. Jay, Cat. 1852. p.270

Lymnaea navicula Val. Jay, Cat. 1852. p.270

Limnea macrostoma Say. Binney, Smith. Misc. Coll. 143. 1865. 7:4

Limnea columella Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Greenport L. I.)

Radix columella Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea columella Say. Beauchamp, Onondaga List. 1886. p.3. (Seneca river)

Limnaea columella Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Erie canal)

Limnaea columella Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.244. (Goat island. Post-Pliocene)

Limnaea megasoma Say

Limnea megasoma Say. DeKay, Nat. Hist. N. Y. 1843. p.70. (Lake Champlain)

Limnaea megasoma Say. Stimpson, New Eng. Shells. 1851. p.52. (Lake Champlain)

Limnaea megasoma Say. Binney, Smith. Misc. Coll. 143. 1865. 7:37. (Lake Champlain)

Bulimnea megosoma Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135. (Lake Champlain)

Limnaea reflexa Say

Limnea reflexa Say. DeKay, Nat. Hist. N. Y. 1843. p.71. (Herkimer county)

Lymnaea reflexa Say. Jay, Cat. 1852. p.270

Lymneus reflexus Say. Say, Conch. U. S. ed. by Binney. 1858. p 65. (Lake Erie)

Limnaea reflexa Say. Binney, Smith. Misc. Coll. 143. 1865. 7:38. (Lake Erie)

Limnophysa reflexa Say. Tryon, Am. Jour. Conch. 1865. 1:249. (Western New York)

Limnaea reflexa Say. Aldrich, Troy List. 1867. p.3. (Mohawk river)

Limnophysa reflexa Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135. (Western New York)

Limnaea reflexa Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Rochester)

Limnaea reflexa umbrosa Say

Limnea umbrosa Say. DeKay, Nat. Hist. N. Y. 1843. p.68

Lymnaea elongata Say. Jay, Cat. 1852. p.269

Lymnaea umbrosa Say. Jay, Cat. 1852. p.271

Limnophysa umbrosa Say. Tryon, Am. Jour. Conch. 1865. 1:250

Physa elongata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Huntington L. I.)

Limnaea umbrosa Say. Beauchamp, Onondaga List. 1886. p.3

Limnaea palustris Müller

Limnea fragilis Linn. DeKay, Nat. Hist. N. Y. 1843. p.68

Lymnaea elodes Say. Jay, Cat. 1852 p.269

Lymnaea fragilis Linn. Jay, Cat. 1852. p.269

Lymnaea palustris Drap. Jay, Cat. 1852. p.270

Lymneus elodes Say. Say, Conch. U. S. ed. by Binney. 1858. p.66. (Canandaigua lake)

Limnaea palustris Müll. Binney, Smith. Misc. Coll. 143. 1865. 7:44

Limnophysa palustris Müll. Tryon, Am. Jour. Conch. 1865. 1:251. (Western New York)

Limnaea elodes Say. Aldrich, Troy List. 1867. p.3. (Troy)

Limnophysa elodes Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea elodes Say. Beauchamp, Onondaga List. 1886. p.3

Limnaea elodes Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Erie canal)

Limnaea desidiosa Say

Lymnaea fusiformis Lea. Lea, Obs. Genus Unio. 1841. 4:10. (Niagara river at Lewiston)

Limnea desidiosa Say. DeKay, Nat. Hist. N. Y. 1843. p.73

Lymnaea desidiosa Say. Jay, Cat. 1852. p.269

Lymnaea acuta Say. Jay, Cat. 1852. p.268

Lymneus desidiosus Say. Say, Conch. U. S. ed. by Binney. 1858. p.66. (Cayuga lake)

Limnaea desidiosa Say. Binney, Smith. Misc. Coll. 143. 1865. 7:48. (Cayuga lake)

Limnaea desidiosa Say. Aldrich, Troy List. 1867. p.3. (Mohawk river)

Limnea desidiosa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Limnophysa desidiosa Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea desidiosa Say. Beauchamp, Onondaga List. 1886. p.3

Limnaea desidiosa Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12

Limnaea desidiosa Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.244. (Goat island. Post-Pliocene)

Limnaea emarginata Say

Limnea emarginata Say. DeKay, Nat. Hist. N. Y. 1843. p.73. (Mohawk river)

Limnaea emarginata Say. Binney, Smith. Misc. Coll. 143. 1865. 7:51. (Owasco lake)

Limnophysa emarginata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea emarginata Say. Beauchamp, Onondaga List. 1886. p.3. (Cross lake)

Limnaea catascopium Say

Limnea catascopium Say. DeKay, Nat. Hist. N. Y. 1843. p.67

Lymnaea catascopium Say. Jay, Cat. 1852. p.268

Limnaea catascopium Say. Binney, Smith. Misc. Coll. 143 1865. 7:53. (Mohawk river)

Limnaea elodes var. catascopium Say. Aldrich, Troy List. 1867. p.3

Limnophysa catascopium Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea catascopium Say. Beauchamp, Onondaga List. 1886. p.3

Limnaea catascopium Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Rochester)

Limnaea catascopium Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.244. (Goat island. Post-Pliocene)

Limnaea caperata Say

Limnea caperata Say. DeKay, Nat. Hist. N. Y. 1843. p.69. (Mohawk river)

Limnaea caperata Say. Binney, Smith. Misc. Coll. 143. 1865. 7:56. (Mohawk river)

Limnaea umbilicata Ads. Aldrich, Troy List. 1867. p.3. (Hudson river)

Limnea caperata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Limnophysa umbilicata Ads. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea umbilicata Ads. Beauchamp, Onondaga List. 1886. p.3

Limnaea caperata Say. Beauchamp, Onondaga List. 1886. p.3

Limnaea caperata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Pittsford)

Limnaea pallida Adams

Limnea pallida Ads. DeKay, Nat. Hist. N. Y. 1843. p.69. (Lake Champlain)

Limnaea pallida Ads. Stimpson, New Eng. Shells. 1851. p.52. (Lake Champlain)

Lymnaea pallida Ads. Jay, Cat. 1852. p.270

Limnaea pallida Ads. Binney, Smith. Misc. Coll. 143. 1865 7:60. (Lake Champlain)

Limnophysa pallida Ads. Lewis, Buf. Soc. Nat. Sci Bul. 2 1874. p.135

Limnaea pallida Ads. Beauchamp, Onondaga List. 1886. p.4. (Onondaga lake)

Limnaea pallida Ads. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Erie canal)

Limnaea humilis Say

Limnea humilis Say. DeKay, Nat. Hist. N. Y. 1843. p.71

Limnea linsleyi DeK. DeKay, Nat. Hist. N. Y. 1843. p.72. (Stratford)

Lymnaea humilis Say. Jay, Cat. 1852. p.269

Limnaea humilis Say. Binney, Smith. Misc. Coll. 143. 1865. 7:63. (Otsego county)

Limnaea humilis Say. Aldrich, Troy List. 1867. p.3. (Mohawk river)

Limnea humilis Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Limnophysa humilis Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Limnaea humilis Say. Beauchamp, Onondaga List. 1886. p.4

Limnaea gracilis Jay

Limnea gracilis Say. DeKay, Nat. Hist. N. Y. 1843. p.70. (Lake Champlain)

Limnaea gracilis Jay. Stimpson, New Eng. Shells. 1851. p.52. (Lake Champlain)

Limnaea gracilis Jay. Binney, Smith. Misc. Coll. 143. 1865. 7:69. (Schuyler's lake)

Acella gracilis Jay. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135. (Niagara river)

Genus PHYSA Draparnaud

Physa gyrina Say

Physa gyrina Say. DeKay, Nat. Hist. N. Y. 1843. p 79. (Northern New York)

Physa elliptica Lea. DeKay, Nat. Hist. N. Y. 1843. p.77

Physa gyrina Say. Binney, Smith. Misc. Coll. 143. 1865. 7:77

Physa hildrethiana Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135

Physa gyrina Say. Beauchamp, Onondaga List. 1886. p.4

Physa gyrina Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Erie canal)

Physa ancillaria Say

Physa ancillaria Say. DeKay, Nat. Hist. N. Y. 1843. p.79 (Lake Champlain)

Physa obesa DeK. DeKay, Nat. Hist. N. Y. 1843. p.78. (Rensselaer county)

Physa obesa DeK. Jay, Cat. 1852. p.271

Physa ancillaria Say. Binney, Smith. Misc. Coll. 143. 1865. 7:81. (Hudson river)

Physa ancillaria Say. Tryon, Am. Jour. Conch. 1865. 1:167

Physa ancillaria Say. Aldrich, Troy List. 1867. p.3. (Hudson river)

Physa ancillaria Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Physa ancillaria Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.135. (Owasco lake)

Physa ancillaria Say. Beauchamp, Onondaga List. 1886. p.4. (Skaneateles)

Physa ancillaria Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Rochester)

Physa heterostropha Say

Physa heterostropha Say. DeKay, Nat. Hist. N. Y. 1843. p.76

Physa cylindrica Newc. DeKay, Nat. Hist. N. Y. 1843. p.77. (Wayne county)

Physa plicata DeK. DeKay, Nat. Hist. N. Y. 1843. p.78. (New York island)

Physa aurea Lea. DeKay, Nat. Hist N. Y. 1843. p.80. (West Point)

Physa heterostropha Say. Jay, Cat. 1852. p.271

Physa plicata DeK. Tryon, Am. Jour. Conch. 1865. 1:165

Physa heterostropha Say. Binney, Smith. Misc. Coll. 143. 1865. 7:84. (Mohawk river)

Physa heterostropha Say. Aldrich, Troy List. 1867. p.3. (Hudson river)

Physa heterostropha Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Physa heterostropha Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Physa heterostropha Say. Beauchamp, Onondaga List. 1886. p.4

Physa heterostropha Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:12. (Rochester)

Physa heterostropha Say. Letson, N. Y. State Mus. Bul 45. 1901. p.245. (Goat island. Post-Pliocene)

Physa integra Haldeman

Physa niagarensis Lea. Lea, Obs. Genus Unio. 1864. 11:129. (Niagara river)

Physa niagarensis Lea. Tryon, Am. Jour. Conch. 1865. 1:168. (Niagara river)

Physa niagarensis Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136. (Niagara river)

Isodora integra Hald. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Physa niagarensis Lea. Beauchamp, Onondaga List. 1886. p.4. (Onondaga lake)

Physa niagarensis Lea. Crandall, Naut. 1901. 15:55. (Niagara river)

Genus APLEXA Leach

Aplexa hypnorum Linnaeus

Physa glabra DeK. DeKay, Nat. Hist. N. Y. 1843. p.80. (Lake Champlain)

Physa elongata Say. DeKay, Nat. Hist. N. Y. 1843. p.81

Physa hypnorum Linn. Jay, Cat. 1852. p.271

Physa elongata Say. Jay, Cat. 1852. p.271

Physa glabra DeK. Tryon, Am. Jour. Conch. 1865. 1:171

Bulinus hypnorum Linn. Binney, Smith. Misc. Coll. 143. 1865. p.99

Physa hypnorum Linn. Aldrich, Troy List. 1867. p.4

Bulinus hypnorum Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Bulinus hypnorum Linn. Beauchamp, Onondaga List. 1886. p.4

Bulinus hypnorum Linn. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Pittsford)

Subfamily PLANORBINAE

Genus PLANORBIS Guettard

Planorbis campanulatus Say

Planorbis campanulatus Say. DeKay, Nat. Hist. N. Y. 1843. p.61. (Western New York)

Planorbis campanulatus Say. Jay, Cat. 1852. p.267

Planorbis campanulatus Say. Say, Conch. U. S. ed. by Binney. 1858. p.64. (Cayuga lake)

Planorbis campanulatus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:109. (Little Lakes)

Planorbis campanulatus Say. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Planorbella campanulatus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis campanulatus Say Beauchamp, Onondaga List. 1886. p.4

Planorbis campanulatus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Pittsford)

Planorbis trivolvis Say

Planorbis trivolvis Say. DeKay, Nat. Hist. N. Y. 1843. p.59

Planorbis megastoma DeK. DeKay, Nat. Hist. N. Y. 1843. p.61. (Lake Ontario)

Planorbis corpulentus Say. DeKay, Nat. Hist. N. Y. 1843. p.64. (Lake Champlain)

Physa planorbula DeK. DeKay, Nat. Hist. N. Y. 1843. p.76. (Cohoes falls)

Planorbis trivolvis Say. Jay. Cat. 1852. p.268

Planorbis trivolvis Say. Say, Conch. U. S. ed by Binney. 1858. p.44. (French creek, near Lake Erie)

Planorbis trivolvis Say. Binney, Smith. Misc. Coll. 143. 1865. 7:115. (Niagara falls)

Planorbis corpulentus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:114

Planorbis trivolvis Say. Aldrich, Troy List. 1867. p.4

Planorbis trivolvis Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Helisoma trivolvis Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis trivolvis Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis trivolvis Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Charlotte)

Planorbis trivolvis lentus Say

Planorbis lentus Say. DeKay, Nat. Hist. N. Y. 1843. p.60. (Western New York)

Planorbis lentus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:104

Planorbis lentus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis lentus Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis bicarinatus Say

Planorbis bicarinatus Say. DeKay, Nat. Hist. N. Y. 1843. p 60

Planorbis bicarinatus Say. Jay, Cat. 1852. p.267

Planorbis bicarinatus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:123. (Herkimer county)

Planorbis bicarinatus Say. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Planorbis bicarinatus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Helisoma bicarinatus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis bicarinatus Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis bicarinatus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13 (Rochester)

Planorbis bicarinatus Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.245. (Goat island. Post-Pliocene)

Planorbis exacutus Say

Planorbis exacutus Say. DeKay, Nat. Hist. N. Y. 1843. p.63.

Planorbis exacutus Say. Jay, Cat. 1852. p.267

Planorbis exacutus Say. Say, Conch. U. S. ed. by Binney. 1858. p.64. (Lake Champlain)

Planorbis exacutus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:126. (Lake Champlain)

Planorbis exacutus Say. Aldrich, Troy List. 1867. p.4. (Hudson river)

Planorbis exacutus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Menetus exacutus Say. Lewis, Buf. Soc. Nat Sci. Bul. 2. 1874. p.136

Planorbis exacutus Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis deflectus Say

Planorbis deflectus Say. DeKay, Nat. Hist. N. Y. 1843. p.65

Planorbis obliquus DeK. DeKay, Nat. Hist. N. Y. 1843. p.62. (Mohawk river)

Planorbis deflectus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:129

Planorbis deflectus Say. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Gyraulus deflectus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874 p 136

Planorbis deflectus Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis deflectus Say. Walton, Rochester Acad Sci Proc. 1892. 2:13. (Brighton)

Planorbis dilatatus Gould

Planorbis dilatatus Gld. DeKay, Nat. Hist N Y. 1843. p.66

Planorbis dilatatus Gld. Binney, Smith. Misc. Coll. 143. 1865. 7:131

Planorbis dilatatus Gld. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Gyraulus dilatatus Gld. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis dilatatus Gld. Beauchamp, Onondaga List. 1886. p.4

Planorbis albus Müller

Planorbis hirsutus Gld. DeKay, Nat. Hist. N. Y. 1843. p.64

Planorbis albus Müll. Binney, Smith. Misc. Coll. 143. 1865. 7:132

Gyraulus albus Müll. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis albus Müll. Beauchamp, Onondaga List. 1886. p.4

Planorbis parvus Say

Planorbis parvus Say. DeKay, Nat. Hist N. Y. 1843. p.63. (Mohawk river)

Planorbis elevatus Ads. DeKay, Nat. Hist. N. Y. 1843. p.65

Planorbis parvus Say. Jay, Cat. 1852. p.268

Planorbis parvus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:133. (Mohawk river)

Planorbis parvus Gld. Aldrich, Troy List. 1867. p.4. (Mohawk river)

Planorbis parvus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Gyraulus parvus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Planorbis parvus Say. Beauchamp, Onondaga List. 1886. p.4

Planorbis parvus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13 (Charlotte)

Planorbis parvus Say. Letson, N. Y. State Mus. Bul. 45. 1901. p.245. (Goat island. Post-Pliocene)

Genus SEGMENTINA Fleming

Segmentina armigera Say

Planorbis armigerus Say. DeKay, Nat. Hist. N. Y. 1843. p.62

Planorbis armigerus Say. Jay, Cat. 1852. p.267

Segmentina armigera Say. Binney, Smith. Misc. Coll. 143. 1865. 7:137

Planorbis armigerus Say. Aldrich, Troy List. 1867. p.4. (Mohawk basin)

Planorbis armigerus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:402. (Long Island)

Planorbula armigera Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.136

Segmentina armigera Say. Beauchamp, Onondaga List. 1886. p.4

Segmentina armigera Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Brighton)

Subfamily ANCYLINAE

Genus ANCYLUS Geoffroy

Ancylus fuscus Adams

Ancylus fuscus Ads. DeKay, Nat. Hist. N. Y. 1843. p.13

Ancylus fuscus Ads. Binney, Smith. Misc. Coll. 143. 1865. 7:140

Ancylus fuscus Ads. Smith & Prime, An. Lyc. N. Y. 1870. 9:399. (Long Island)

Ancylus fuscus Ads. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Ancylus parallelus Haldeman

Ancylus parallelus Hald. Binney, Smith. Misc. Coll. 143. 1865. 7:142

Ancylus parallelus Hald. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137

Ancylus parallelus Hald. Beauchamp, Onondaga List. 1886. p.5

Ancylus parallelus Hald. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Charlotte)

Ancylus rivularis Say

Ancylus rivularis Say. DeKay, Nat. Hist. N. Y. 1843. p.12

Ancylus rivularis Say. Binney, Smith. Misc. Coll. 143. 1865. 7:142

Ancylus rivularis Say. Beauchamp, Onondaga List. 1886. p.4

Ancylus rivularis Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Genesee river)

Ancylus tardus Say

Ancylus tardus Say. Binney, Smith. Misc. Coll. 143. 1865. 7:143. (Mohawk river)

Ancylus tardus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.137. (Little Lakes)

Ancylus tardus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:13. (Irondequoit)

Ancylus calcarius DeKay

Ancylus calcarius DeK. DeKay, Nat. Hist. N. Y. 1843. p.13

Ancylus calcarius DeK. Binney, Smith. Misc. Coll. 143. 1865. p.143

Ancylus borealis Morse

Ancylus borealis Morse. Binney, Smith. Misc. Coll. 143. 1865. 7:156. (Patten)

Genus GUNDLACHIA Pfeiffer

Gundlachia stimpsoniana Smith

Gundlachia stimpsoniana Smith. Smith & Prime, An. Lyc. N. Y. 1870. 9:399. (Long Island)

Gundlachia sp.

Gundlachia sp. J. M. Clarke, Am. Jour. Sci. 1882. ser. 3. 23:248. (Canandaigua)

Class POLYPLACOPHORA

Family ISCHNOCHITONIDAE

Genus CHAETOPLEURA Shuttleworth

Chaetopleura apiculata Say

Chiton apiculatus Say. DeKay, Nat. Hist. N. Y. 1843. p.164

Chiton apiculatus Say. Jay, Cat. 1852. p.97

Chiton apiculatus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:392

Chaetopleura apiculata Say. Tryon, Man. Conch. 1892. 14:35

Genus TRACHYDERMON Carpenter

Trachydermon albus Linnaeus

Chiton albus Linn. DeKay, Nat. Hist. N. Y. 1843. p.163

Chiton albus Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:392

Ischnochiton albus Linn. Tryon, Man. Conch. 1892. 14:70

Class PELECYPODA

Order SIPHONIDA

Suborder SINUPALLIATA

Family TEREDIDAE

Genus TEREDO Linnaeus

Teredo navalis Linnaeus

Teredo navalis Linn. DeKay, Nat. Hist. N. Y. 1843. p.249

Teredo dilatata Stimpson

Teredo dilatata St. Smith & Prime, An. Lyc. N. Y. 1870. 9:391. (Greenport)

Family PHOLADIDAE

Subfamily PHOLADINAE

Genus PHOLAS Linnaeus

Pholas costata Linnaeus

Pholas truncata Say. DeKay, Nat. Hist. N. Y. 1843. p.248. (Westchester and Richmond counties)

Pholas truncata Say. Jay, Cat. 1852. p.10

Pholas costata Linn. Jay, Cat. 1852. p.10

Pholas truncata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:391. (Rockaway)

Pholas costata Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:391

Genus ZIRFAEA Leach

Zirfaea crispata Linnaeus

Pholas crispata Linn. DeKay, Nat. Hist. N. Y. 1843. p.247. (Long Island)

Pholas crispata Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:391

Family SOLENIDAE

Genus ENSIS Schumacher

Ensis directus Conrad

Solen ensis Linn. DeKay, Nat. Hist. N. Y. 1843. p.242

Solen ensis Linn. Jay, Cat. 1852. p.11

Solen vagina Linn. Jay, Cat. 1852. p.11

Solen siliqua Linn. Jay, Cat, 1852. p.11
Solen ensis Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:389
Ensis directus Conr. Dall, Nat. Mus. Proc. 1900. 22:107

Genus SILIQUA Megerle

Siliqua costata Say

Machaera costata Say. DeKay, Nat. Hist. N. Y. 1843. p.244
Machaera costata Say. Jay, Cat. 1852. p.12
Machaera costata Gld. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Coney Island, Rockaway, East Hampton)
Siliqua costata Say. Dall, Nat. Mus. Proc. 1900. 22:108

Family SOLENINAE
Subfamily PHARELLINAE
Genus TAGELUS Gray

Tagelus gibbus Spengl

Solecurtus caribaeus Lam. DeKay, Nat. Hist. N. Y. 1843. p.243. (Westchester county)
Solecurtus caribaeus Lam. Jay, Cat. 1852. p.12. (Westchester county)
Solecurtus gibbus F. & H. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Long Island)

Tagelus divisus Spengl.

Solecurtus bidens F. & H. Smith & Prime, An. Lyc. N. Y. 1870. 9:389

Family SAXICAVIDAE
Genus SAXICAVA Fleuriau

Saxicava arctica Linnaeus

Saxicava distorta Say. DeKay, Nat. Hist. N. Y. 1843. p.227. (Long Island)
Saxicava pholadis var. Lam. Jay, Cat. 1852. p.22
Saxicava arctica Desh. Smith & Prime, An. Lyc. N. Y. 1870. 9:390. (Long Island sound)

Family MYACIDAE
Genus MYA Linnaeus

Mya arenaria Linn.

Mya arenaria Linn. DeKay, Nat. Hist. N. Y. 1843. p.240. (Long Island sound)
Mya arenaria Linn. Jay, Cat. 1852. p.13
Mya arenaria Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Family CORBULIDAE

Genus CORBULA Lamarck

Corbula contracta Say

Corbula contracta Say. DeKay, Nat. Hist. N. Y. 1843. p.241. (Long Island sound)

Corbula contracta Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Family ANATINIDAE

Genus PANDORA Bruguiere

Pandora trilineata Say

Pandora trilineata Say. DeKay, Nat. Hist. N. Y. 1843. p.239. (Long Island sound)

Pandora trilineata Say. Jay, Cat. 1852. p.15

Pandora trilineata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:390. (Montauk point)

Genus THRACIA Leach

Thracia conradi Couthouy

Thracia conradi Couth. DeKay, Nat. Hist. N. Y. 1843. p.237. (Long Island sound)

Thracia conradi Couth. Smith & Prime, An. Lyc. N. Y. 1870. 9:390. (Greenport)

Thracia truncata Mighels

Thracia truncata Migh. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Genus COCHLODESMA Couthouy

Cochlodesma leana Conrad

Cochlodesma leana Conr. DeKay, Nat. Hist. N. Y. 1843. p.236

Cochlodesma leana Conr. Jay, Cat. 1852. p.16

Cochlodesma leanum Migh. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Genus LYONSIA Turton

Lyonsia hyalina Conrad

Osteodesma hyalina Conr. DeKay, Nat. Hist. N. Y. 1843. p.234

Osteodesma hyalina Conr. Jay, Cat. 1852. p.16

Lyonsia hyalina Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:390. (Greenport)

Genus ANATINA Lamarck

Anatina papyracea Say

Anatina papyracea Say. DeKay, Nat. Hist. N. Y. 1843. p.235
Anatina papyracea Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Gardiner's bay)

Family MACTRIDAE

Subfamily MACTRINAE

Genus SPISULA Gray

Spisula solidissima Chemnitz

Mactra solidissima Chem. DeKay, Nat. Hist. N. Y. 1843. p.229. (Long Island sound)
Mactra gigantea Lam. Jay, Cat. 1852. p.19
Mactra solidissima Chem. Jay, Cat. 1852. p.19
Mactra solidissima Chem. Smith & Prime, An. Lyc. N. Y. 1870. 9:388

Genus MULINIA Gray

Mulinia lateralis Say

Mactra lateralis Say. DeKay, Nat. Hist. N. Y. 1843. p.230. (Westchester county)
Mactra lateralis Say. Jay, Cat. 1852. p.19
Mactra lateralis Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:388. (Long Island sound)

Family SEMELIDAE

Genus CUMINGIA Sowerby

Cumingia tellinoides Conrad

Cumingia tellinoides Conr. DeKay, Nat. Hist. N. Y. 1843. p.233
Cumingia tellinoides Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:388. (Montauk point)

Family TELLINIDAE

Genus TELLINA Lamarck

Tellina (Angulus) tenera Say

Tellina tenera Say. DeKay, Nat. Hist. N. Y. 1843. p.209
Tellina tenera Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:389
Tellina tenera Say. Stimpson, New Eng. Shells. 1851. p.21
Tellina (Angulus) tenera Say. Dall, Nat. Mus. Proc. 1901. 23:295

Tellina (Angulus) tenella Verrill

Tellina (Angulus) tenella Ver. Dall, Nat. Mus. Proc. 1901. 23:295

Tellina (Angulus) versicolor Cozzens

Tellina versicolor Coz. DeKay, Nat. Hist. N. Y. 1843. p.209. (Hudson river)

Tellina versicolor Coz. Stimpson, New Eng. Shells. 1851. p.21. (Long Island sound)

Tellina (Angulus) versicolor Coz. Dall, Nat. Mus. Proc. 1901. 23:295

Tellina (Scissula) iris Say

Tellina iris Say. Jay, Cat. 1852. p.26

Tellina (Scissula) iris Say. Dall, Nat. Mus. Proc. 1901. 23:297

Genus MACOMA Leach

Macoma balthica Linnaeus

Sanguinolaria fusca Say. DeKay, Nat. Hist. N. Y. 1843. p.212. (Long Island sound)

Psammobia fusca Say. Jay, Cat. 1852. p.24

Tellina fusca Say. Jay, Cat. 1852. p.26

Tellina fusca Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Greenport)

Macoma balthica Linn. Dall, Nat. Mus. Proc. 1901. 23:298

Macoma calcarea Gmelin

Sanguinolaria sordida Couth. DeKay, Nat. Hist. N. Y. 1843. p.213

Macoma calcarea Gmel. Dall, Nat. Mus. Proc. 1901. 23:299. (Long Island sound)

Macoma tenta Say

Tellina tenta Say. DeKay, Nat. Hist. N. Y. 1843. p.210

Tellina tenta Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Greenport)

Macoma tenta Say. Dall, Nat. Mus. Proc. 1901. 23:299

Subfamily DONACINAE

Genus DONAX Linnaeus

Donax fossor Say

Donax fossor Say. DeKay, Nat. Hist. N. Y. 1843. p.211

Donax fossor Say. Jay, Cat. 1852. p.31

Donax fossor Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:388. (Long Island sound)

Family PETRICOLIDAE

Genus PETRICOLA Lamarck

Petricola dactylus Sowerby

Petricola dactylus Sow. DeKay, Nat. Hist. N. Y. 1843. p.228. (Glasshouse point)

Petricola dactylus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Petricola pholadiformis Lamarck

Petricola pholadiformis Lam. DeKay, Nat. Hist. N. Y. 1843. p.228. (Long Island sound)

Petricola pholadiformis Lam. Jay, Cat. 1852. p.23

Petricola pholadiformis Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9:390

Family VENERIDAE

Subfamily VENERINAE

Genus VENUS Linnaeus

Venus mercenaria Linnaeus

Venus mercenaria Linn. DeKay, Nat. Hist. N. Y. 1843. p.217. (Long Island sound)

(?) Venus praeoparea Say. DeKay, Nat. Hist. N. Y. 1843. p.219

Venus mercenaria Linn. Jay, Cat. 1852. p.40

Venus mercenaria Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:388

Venus mercenaria notata Say

Venus mercenaria var. notata Say. DeKay, Nat. Hist. N. Y. 1843. p.218. (Long Island sound)

Venus notata Say. Jay, Cat. 1852. p.41

Venus notata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:388.

Genus MERETRIX Lamarck

Meretrix convexa Say

Cytherea convexa Say. DeKay, Nat. Hist. N. Y. 1843. p.216. (Long Island sound)

Cytherea convexa Say. Stimpson, New Eng. Shells. 1851. p.19. (Long Island sound)

Cytherea convexa Say. Jay, Cat. 1852. p.35

Cytherea convexa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:388. (New York bay, East Hampton and Montauk)

Meretrix convexa Say. Dall, Zittel, Text-book Pal. 1900. p.415

Subfamily DOSININAE

Genus GEMMA Deshayes

Gemma gemma Totten

Venus gemma Tott. DeKay, Nat. Hist. N. Y. 1843. p.218. (East river)

Venus gemma Tott. Jay, Cat. 1852. p.40

Venus gemma Tott. Smith & Prime, An. Lyc. N. Y. 1870. 9:388

Gemma gemma manhattensis Prime

Venus manhattensis Prime. Jay, Cat. 1852. p.466

Venus manhattensis Prime. Prime, Pamph. 1862. (East river)

Venus manhattensis Prime. Smith & Prime, An. Lyc. N. Y. 1870. 9:388. (Hell Gate, Huntington and Greenport)

Suborder INTEGRIPALLIATA

Family CYRENIDAE

Genus SPHAERIUM Scopoli

Sphaerium simile Say

Cyclas similis Say. DeKay, Nat. Hist. N. Y. 1843. p.222. (Orleans county)

Sphaerium sulcatum Lam. Prime, Monogr. 1862. p.4

Sphaerium sulcatum Lam. Prime, List. 1863. p.8. (Washington county)

Sphaerium sulcatum Lam. Prime, Smith. Misc. Coll. 145. 1865. 7:33

Sphaerium sulcatum Lam. Aldrich, Troy List. 1867. p.2. (Mohawk river)

Sphaerium simile Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Sphaerium simile Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139

Sphaerium simile Say. Beauchamp, Onondaga List. 1886. p.6

Sphaerium similis Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:18. (Erie canal)

Sphaerium simile Say. Sterki, Ms. 1902

Sphaerium rhomboideum Say

Cyclas rhomboidea Say. DeKay, Nat. Hist. N. Y. 1843. p.224. (Rockland county)

Cyclas elegans Ads. DeKay, Nat. Hist. N. Y. 1843. p.224. (Lake Champlain)

Cyclas rhomboidea Say. Say, Conch. U. S. ed. by Binney. 1858. p.111. (Lake Champlain)

Sphaerium rhomboideum Say. Prime, Monogr. 1862. p.7

Sphaerium rhomboideum Say. Prime, List. 1863. p.9. (Washington county)

Sphaerium rhomboideum Say. Prime. Smith. Misc. Coll. 145. 1865. 7:39

Sphaerium rhomboideum Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139

Sphaerium striatinum Lamarck

Cyclas edentula Say. DeKay, Nat. Hist. N. Y. 1843. p.225. (Canandaigua lake)

Cyclas edentula Say. Say, Conch. U. S. ed. by Binney. 1858. p.137. (Canandaigua lake)

Sphaerium striatinum Lam. Prime, Monogr. 1862. p.6

Sphaerium striatinum Lam. Prime, List. 1863. p.9. (St Lawrence river)

Sphaerium striatinum Lam. Prime, Smith. Misc. Coll. 145. 1865. 7:37

Sphaerium striatinum Lam. Aldrich, Troy List. 1867. p.2. (Mohawk river)

Sphaerium striatinum Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Sphaerium striatinum Lam. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139

Sphaerium striatinum Lam. Beauchamp, Onondaga List. 1886. p.6

Sphaerium striatinum Lam. Letson, N. Y. State Mus. Bul. 45. 1901. p.246. (Goat island. Post-Pliocene)

Sphaerium solidulum Prime

Sphaerium solidulum Prime. Prime, Monogr. 1862. p.5

Sphaerium solidulum Prime. Prime, List. 1863. p.9. (Herkimer county)

Sphaerium solidulum Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:36

Sphaerium solidulum Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.139

Sphaerium solidulum Prime. Beauchamp, Onondaga List. 1886. p.6

Sphaerium vermontanum Prime

Sphaerium vermontanum Prime. Prime, Monogr. 1862. p.9. (Lake Champlain)

Sphaerium vermontanum Prime. Prime, List. 1863. p.10. (Lake Champlain)

Sphaerium occidentale Prime

Sphaerium occidentale Prime. Prime, Monogr. 1862. p.8

Sphaerium occidentale Prime. Prime, List. 1863. p.10. (Herkimer county)

Sphaerium occidentale Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:41

Sphaerium occidentale Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Sphaerium occidentale Prime. Beauchamp, Onondaga List. 1886. p.6

Sphaerium fabale Prime

Sphaerium fabalis Prime. Prime, Monogr. 1862. p.8

Sphaerium fabalis Prime. Prime, List. 1863. p.10. (Greenwich)

Sphaerium fabalis Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:40

Sphaerium fabale Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140. (Wayne and Herkimer counties)

Sphaerium fabale Prime. Beauchamp, Onondaga List. 1886. p.6

Sphaerium stamineum Conrad

Sphaerium stamineum Conr. Beauchamp, Onondaga List. 1886. p.6

Sphaerium stamineum Conr. Letson, N. Y. State Mus. Bul. 45. 1901. p.246. (Goat island. Post-Pliocene)

Family CYCLADIDAE

Genus CALYCULINA Clessin

Calyculina transversa Say

Sphaerium transversum Say. Prime, Monogr. 1862. p.13

Sphaerium transversum Say. Prime, List. 1863. p.11. (Herkimer county)

Sphaerium transversum Say. Prime, Smith. Misc. Coll. 145. 1865. 7:48

Sphaerium transversum Say., Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Sphaerium transversum Say. Beauchamp, Onondaga List. 1886. p.6. (Erie canal)

Calyculina partumeia Say

Cyclas partumeia Say. DeKay, Nat. Hist. N. Y. 1843. p.223

Sphaerium partumium Say. Prime, Monogr. 1862. p.11

Sphaerium partumeium Say. Prime, List. 1863. p.10. (Lake George, Erie canal)

Sphaerium partumeium Say. Prime, Smith. Misc. Coll. 145. 1865. p.45

Sphaerium partumeium Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Long Island)

Sphaerium partumeium Say. Lewis, Buf. Soc. Nat. Sci. Bul. 1874. 2:140

Sphaerium partumeium Say. Beauchamp, Onondaga List. 1886. p.6

Sphaerium partumeium Say. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.18. (Genesee river)

Calyculina partumeia Say. Sterki, Naut. 1902. 16:92

Calyculina truncata Linsley

Sphaerium truncatum Lins. Prime, Monogr. 1862. p.17

Sphaerium truncatum Lins. Prime, List. 1863. p.11. (Lake Champlain)

Sphaerium truncatum Lins. Prime, Smith. Misc. Coll. 145. 1865. 7:51

Sphaerium truncatum Lins. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Sphaerium truncatum Lins. Beauchamp, Onondaga List. 1886. p.6

Calyculina truncata Lins. Sterki, Naut. 1902. 16:92

Calyculina rosacea Prime

Sphaerium rosaceum Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:50

Sphaerium rosaceum Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Calyculina rosacea Prime. Sterki, Naut. 1902. 16:92

Calyculina securis Prime

Sphaerium securis Prime. Prime, Monogr. 1862. p.16

Sphaerium securis Prime. Prime, List. 1863. p.11. (Staten Island)

Cyclas crocea Lewis. Prime, List. 1863. p.11. (Otsego county)

Sphaerium securis Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:49

Sphaerium securis Prime. Aldrich, Troy List. 1867. p.2. (Mohawk basin)

Sphaerium securis Prime. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Long Island)

Sphaerium secure Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Sphaerium croceum Lewis. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140. (Herkimer county)

Sphaerium secure Prime. Beauchamp, Onondaga List. 1886. p.6

Calyculina securis Prime. Sterki, Naut. 1902. 16:93

Genus PISIDIUM Pfeiffer

Pisidium abditum Haldeman

Pisidium abditum Hald. Prime, List. 1863. p.14. (Herkimer county, Buffalo)

Pisidium notatum Prime. Prime, List. 1863. p.15. (Greenwich)

Pisidium resartum Ingalls. Prime, List. 1863. p.15. (Greenwich)

Pisidium rubrum Lewis. Prime, List. 1863. p.15. (Herkimer county)

Pisidium plenum Lewis. Prime, List. 1863. p.15. (Otsego county)

Pisidium abditum Hald. Prime, Smith. Misc. Coll. 145. 1865. 7:68

Pisidium abditum Hald. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Long Island)

Pisidium abditum Hald. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium abditum Hald. Beauchamp, Onondaga List. 1886. p.6

Pisidium abditum Hald. Letson, N. Y. State Mus. Bul. 45. 1901. p.247. (Goat island. Post-Pliocene)

Pisidium virginicum Bourguignat

Cyclas dubia Say. DeKay, Nat. Hist. N. Y. 1843. p.223. (Lake George)

Pisidium virginicum Bourg. Prime, List. 1863. p.13. (Hudson river, Buffalo)

Pisidium virginicum Bourg. Prime, Smith. Misc. Coll. 145. 1865. 7:61

Pisidium virginicum Bourg. Aldrich, Troy List. 1867. p.3. (Hudson river)

Pisidium virginicum Bourg. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Pisidium virginicum Bourg. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium virginicum Bourg. Beauchamp, Onondaga List 1886. p.6

Pisidium virginicum Gmel. Carpenter, Naut. 1901. 15:132

Pisidium virginicum Bourg. Letson, N. Y. State Mus. Bul. 45. 1901. p.247. (Goat island. Post-Pliocene)

Pisidium novi-eboracense Prime

Pisidium nov. eboracense Prime. Prime, List. 1863. p.14. (Herkimer and Otsego counties)

Pisidium nov-eboracense Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:67

Pisidium nov. eboracense Prime. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Pisidium novi-eboracense Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium noveboracense Prime. Beauchamp, Onondaga List. 1886. p.6

Pisidium ventricosum Prime

Pisidium ventricosum Prime. Prime, List. 1863. p.15. (Herkimer and Otsego counties)

Pisidium ventricosum Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:72

Pisidium ventricosum Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium aequilaterale Prime

Pisidium aequilaterale Prime. Prime, List. 1863. p.14. (Hudson river)

Pisidium aequilaterale Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:63

Pisidium aequilaterale Prime. Smith & Prime, An. Lyc. N. Y. 1870. 9:380. (Westchester county)

Pisidium aequilaterale Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium compressum Prime

Pisidium compressum Prime. Prime, List. 1863. p.14. (Herkimer and Otsego counties)

Pisidium compressum Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:64

Pisidium compressum Prime. Aldrich, Troy List. 1867. p.3. (Mohawk river)

Pisidium compressum Prime. Smith & Prime, An. Lyc. N Y. 1870. 9:380. (Westchester county)

Pisidium compressum Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium compressum Prime. Beauchamp, Onondaga List. 1886. p.6

Pisidium compressum Prime. Letson, N. Y. State Mus. Bul. 45. 1901. p.247. (Goat island. Post-Pliocene)

Pisidium ferrugineum Prime

Pisidium ferrugineum Prime. Prime, List. 1863. p.15. (Herkimer county)

Pisidium ferrugineum Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:71

Pisidium ferrugineum Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium ferrugineum Prime. Beauchamp, Onondaga List. 1886. p.6

Pisidium variabile Prime

Pisidium variabile Prime. Prime, Smith. Misc. Coll. 145. 1865. 7:66

Pisidium variabile Prime. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Long Island)

Pisidium variabile Prime. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Pisidium variabile Prime. Beauchamp, Onondaga List. 1886. p.6

Pisidium variabile Prime. Walton, Rochester Acad. Sci. Proc. 1892. 2:18. (Monroe county)

Pisidium affine Sterki

Pisidium affine Stk. Sterki, Naut. 1901. 15:66

Pisidium sargenti Sterki

Pisidium sargenti Stk Sterki, Naut. 1901. 15:67. (Mohawk river)

Pisidium strengii Sterki

Pisidium strengii Stk. Sterki, Naut. 1901. 15:126. (Little Lakes)

Pisidium streatori Sterki

Pisidium streatori Stk. Sterki, Naut. 1901. 14:100. (Canasaraga river)

Pisidium punctatum Sterki

Pisidium punctatum Stk. Sterki, Ms. Nov. 1901. (Herkimer county)

Pisidium pauperculum Sterki

Pisidium pauperculum Stk. Sterki, Ms. 1901

Pisidium walkeri Sterki

Pisidium walkeri Stk. Sterki, Ms. 1901. (Mohawk river)

Pisidium roperi Sterki

Pisidium roperi Stk. Sterki, Ms. 1901

Pisidium rotundatum Sterki

Pisidium rotundatum Stk. Sterki, Ms. 1901

Pisidium splendidulum Sterki

Pisidium splendidulum Stk. Sterki, Ms. 1901. (Long Island)

Pisidium scutellatum Sterki

Pisidium scutellatum Stk. Sterki, Ms. 1901. (Chautauqua lake)

Pisidium scutellatum Stk. Letson, N. Y. State Mus. Bul. 45. 1901. p.248. (Goat island. Post-Pliocene)

Pisidium medianum Sterki

Pisidium medianum Stk. Sterki, Ms. 1901. (Mohawk)

Pisidium ultramontanum Prime

Pisidium ultramontanum Prime. Letson, N. Y. State Mus. Bul. 45. 1901. p.248. (Goat island. Post-Pliocene)

Genus CYCLAS Bruguiere

Cyclas islandica Linnaeus

Cyprina islandica Linn. DeKay, Nat. Hist. N. Y. 1843. p.215

Cyprina islandica Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:387. (Montauk point)

Family CARDIIDAE

Genus CARDIUM Lamarck

Cardium (Cerastoderma) pinnulatum Conrad

Cardium pinnatulum Conr. DeKay, Nat. Hist. N. Y. 1843. p.205. (Long Island sound)

Cardium pinnulatum Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:387. (Long Island sound)

Cardium (Cerastoderma) pinnulatum Conr. Dall, Nat. Mus. Proc. 1901. 23:386

Cardium (Cerastoderma) ciliatum Fabricius

Cardium islandicum Linn. DeKay, Nat. Hist. N. Y. 1843. p.206

Cardium (Cerastoderma) ciliatum Fab. Dall, Nat. Mus. Proc. 1901. 23:386

Cardium (Laevicardium) mortoni Conrad

Cardium mortoni Conr. DeKay, Nat. Hist. N.Y. 1843. p.207. (Long Island sound)

Cardium mortoni Conr. Jay, Cat. 1852. p.45

Cardium mortoni Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:387

Cardium (Laevicardium) mortoni Conr. Dall, Nat. Mus. Proc. 1901. 23:388

Genus SERRIPES Beck

Serripes gronlandicus Gmelin

Cardium groenlandicum Gmel. DeKay, Nat. Hist. N. Y. 1843. p.206

Serripes gronlandicus Gmel. Dall, Nat. Mus. Proc. 1901. 23:388

Family LUCINIDAE

Genus PHACOIDES Blainville

Phacoides filosus Stimpson

Lucina filosa St. Carpenter, Naut. 1902. 15:17

Genus DIVARICELLA von Martens

Divaricella quadrisulcata d'Orbigny

Lucina strigilla St. Smith & Prime, An. Lyc. N. Y. 1870. 9:387. (Coney Island)

Divaricella quadrisulcata d'Orb. Dall, Nat. Mus. Proc. 1901. 23:815

Subgenus LUCINELLA Monterosato

Lucinella divaricata Linnaeus

Lucina divaricata Linn. DeKay, Nat. Hist. N. Y. 1843. p.214

Lucinella divaricata Linn. Dall, Nat. Mus. Proc. 1901. 23:815

Family ERYCINIDAE

Genus MONTACUTA Turton

Montacuta bidentata Montagu

Montacuta bidentata Mont. Verrill, Nat. Mus. Proc. 1898. 20:779. (Long Island sound)

Montacuta elevata Stimpson

Montacuta elevata St. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Greenport)

Genus KELLIA Turton

Kellia planulata Stimpson

Kellia planulata St. Stimpson, New Eng. Shells. 1851. p.17

Kellia planulata St. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Montauk)

Family SOLEMYIDAE

Genus SOLEMYA Lamarck

Solemya velum Say

Solemya velum Say. DeKay, Nat. Hist. N. Y. 1843. p.245. (Long Island sound)

Solemya velum Say. Jay, Cat. 1852. p.13

Solemya velum Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:389. (Greenport)

Family CRASSATELLIDAE

Genus ERYPHYLA Gabb

Eryphyla lunulata Conrad

Astarte lunulata Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:387

Family ASTARTIDAE

Genus ASTARTE Sowerby

Astarte castanea Say

Astarte castanea Say. DeKay, Nat. Hist. N. Y. 1843. p.220. (Long Island sound)

Astarte castanea Say. Jay, Cat. 1852. p.34

Astarte castanea Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:387. (Sandy Hook)

Astarte sulcata Montague

Astarte sulcata Mont. DeKay, Nat. Hist. N. Y. 1843. p.221. (Long Island sound)

Astarte sulcata Flem. Smith & Prime, An. Lyc. N. Y. 1870. 9:387

Subfamily CARDITINAE

Genus VENERICARDIA Lamarck

Venericardia borealis Conrad

Cardita borealis Conr. DeKay, Nat. Hist. N. Y. 1843. p.204. (Long Island sound)

Cardita borealis Conr. Smith & Prime, An. Lyc. N. Y. 1870. 9:387. (Gardiner's bay)

Order ASIPHONIDA

Suborder HOMOMYARIA

Family UNIONIDAE

Genus TRUNCILLA Rafinesque

Truncilla triquetra Rafinesque

Unio triangularis Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Truncilla triquetra Raf. Simpson, Nat. Mus. Proc. 1900. 22:517

Genus MICROMYA Agassiz

Micromya fabalis Lea

Micromya fabalis Lea. Simpson, Nat. Mus. Proc. 1900. 22:525

Genus LAMPSILIS Rafinesque

Lampsilis ventricosus Barnes

Unio ventricosus Barnes. DeKay, Nat. Hist. N. Y. 1843. p.190. (Lake Champlain)

Unio occidens Lea. Lewis, Buf. Soc Nat. Sci. Bul. 2. 1874. p.141

Unio ventricosus Barnes. Beauchamp, Onondaga List. 1886. p.7. (Seneca river)

Unio occidens Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Erie canal)

Lampsilis ventricosus Barnes. Simpson, Nat. Mus. Proc. 1900. 22:526

Lampsilis cariosus Say

Unio cariosus Say. DeKay, Nat. Hist. N. Y. 1843. p.193. (Hudson river)

Unio cariosus Say. Aldrich, Troy List. 1867. p.1. (Mohawk and Hudson rivers, Erie canal)

Unio cariosus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Unio cariosus Say. Beauchamp, Onondaga List. 1886. p.6. (Oswego river)

Unio cariosus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Lampsilis cariosus Say. Simpson, Nat. Mus. Proc. 1900. 22:528

Lampsilis ochraceus Say

Unio ochraceus Say. DeKay, Nat. Hist. N. Y. 1843. p.193. (Mohawk river)

Unio ochraceus Say. Aldrich, Troy List. 1867. p.1. (Mohawk river)

Unio ochraceus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Lampsilis ochraceus Say. Simpson, Nat. Mus. Proc. 1900. 22:530

Lampsilis multiradiatus Lea

Unio multiradiatus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Lampsilis multiradiatus Lea. Simpson, Nat. Mus. Proc. 1900. 22:532

Lampsilis luteolus Lamarck

Unio luteolus Lam. DeKay, Nat. Hist. N. Y. 1843. p.190. (Little Falls, Lake Champlain, Mohawk river, Orleans county)

Lampsilis siliquoides Barnes. Stimpson, New Eng. Shells. 1851. p.14. (Lake Champlain)

Unio inflatus Barnes. Jay, Cat. 1852. p.61. (Lake Erie)

Unio luteolus Lewis. Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio luteolus Lam. Beauchamp, Onondaga List. 1886. p.7

Unio luteolus Lam. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Genesee river)

Lampsilis luteolus Lam. Simpson, Nat. Mus. Proc. 1900. 22:534

Lampsilis luteolus var. rosaceus DeKay

Unio rosaceus DeK. DeKay, Nat. Hist. N. Y. 1843. p.192. (Seneca lake)

Unio rosaceus DeK. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio rosaceus DeK. Beauchamp, Onondaga List. 1886. p.7

Unio rosaceus DeK. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Lake Ontario)

Lampsilis luteolus var. rosaceus DeK. Simpson, Nat. Mus. Proc. 1900. 22:535

Lampsilis borealis Gray

Lampsilis borealis Gray. Simpson, Nat. Mus. Proc. 1900. 22:535

Lampsilis radiatus Gmelin

Unio boydianus Lea. Lea, Obs. Genus Unio. 1842. 3:54. (Orleans county)

Unio radiatus Gml. DeKay, Nat. Hist. N. Y. 1843. p.189

Unio boydianus Lea. DeKay, Nat. Hist. N. Y. 1843. p.189. (Orleans county)

Unio boydianus Lea. Jay, Cat. 1852. p.55

Unio radiatus Lam. Aldrich, Troy List. 1867. p.2

Unio radiatus Lam. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio boydianus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Unio radiatus Lam. Beauchamp, Onondaga List. 1886. p.7

Lampsilis radiatus Gmel. Simpson, Nat. Mus. Proc. 1900. 22:535

Lampsilis ligamentinus Lamarck

Unio ligamentinus Lam. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio ligamentinus Lam. Beauchamp, Onondaga List. 1886. p.7. (Cross lake)

Lampsilis ligamentinus Lam. Simpson, Nat. Mus. Proc. 1900. 22:539

Lampsilis anodontoides Lea

Unio anodontoides Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Lampsilis anodontoides Lea. Simpson, Nat. Mus. Proc. 1900. 22:543

Lampsilis rectus Lamarck

Unio rectus Lam. DeKay, Nat. Hist. N. Y. 1843. p.195. (Lake Champlain)

Unio rectus Lam. Jay, Cat. 1852. p.65. (Lake Erie)

Unio rectus Lam. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141. (Lake Champlain)

Unio rectus Lam. Beauchamp, Onondaga List. 1886. p.7

Unio rectus Lam. Walton, Rochester Acad. Sci. Proc. 1892. 2:16 (Erie canal)

Lampsilis rectus Lam. Simpson, Nat. Mus. Proc. 1900. 22:544.

Lampsilis rectus Lam. Letson, N. Y. State Mus. Bul. 45. 1901. p.248. (Goat island. Post-Pliocene)

Lampsilis nasutus Say

Unio nasutus Say. DeKay, Nat. Hist. N. Y. 1843. p.191. (Lake Ontario)

Unio nasutus Say. Jay, Cat. 1852. p.62

Unio nasutus Say. Aldrich, Troy List. 1867. p.1. (Mohawk basin)

Unio nasutus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Lampsilis nasutus Say. Simpson, Nat. Mus. Proc. 1900. 22:545.

Lampsilis subrostratus Say

Unio subrostratus Say. Jay, Cat. 1852. p.66

Lampsilis subrostratus Say. Simpson, Nat. Mus. Proc. 1900. 22:546

Lampsilis iris Lea

Unio novi-eboraci Lea. Lea, Obs. Genus Unio. 1838. 2:104. (Orleans county)

Unio novi-eboraci Lea. DeKay, Nat. Hist. N. Y. 1843. p.194. (Orleans county)

Unio novi-eboraci Lea. Jay, Cat. 1852. p.62

Unio novi-eboraci Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio iris Lea. Beauchamp, Onondaga List. 1886. p.7. (Erie canal)

Unio novi-eboraci Lea. Beauchamp, Onondaga List. 1886. p.7

Unio novi-eboraci Lea. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.15. (Erie canal)

Unio iris Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Lampsilis iris Lea. Simpson, Nat. Mus. Proc. 1900. 22:552

Lampsilis ellipsiformis Conrad

Unio spatulatus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Lampsilis ellipsiformis Conr. Simpson, Nat. Mus. Proc. 1900. 22:557

Lampsilis ellipsiformis Conr. Letson, N. Y. State Mus. Bul. 45. 1901. p.249. (Prospect park. Post-Pliocene)

Lampsilis parvus Barnes

Unio parvus Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio parvus Barnes. Beauchamp, Onondaga List. 1886. p.7. (Erie canal)

Lampsilis parvus Barnes. Simpson, Nat. Mus. Proc. 1900. 22:564

Lampsilis alatus Say

Unio alatus Say. DeKay, Nat. Hist. N. Y. 1843. p.195. (Lakes Champlain and Erie)

Metaptera alatus Say. Stimpson, New Eng. Shells. 1851. p.14. (Lake Champlain)

Unio alatus Say. Say, Conch. U. S. ed. by Binney. 1858. p.52. (Lake Erie)

Unio alatus Say. Aldrich, Troy List. 1867. p.1. (Northern canal)

Unio alatus Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.140

Unio alatus Say. Beauchamp, Onondaga List. 1886. p.7

Unio alatus Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Lampsilis alatus Say. Simpson, Nat. Mus. Proc. 22. 1900. p.567

Lampsilis gracilis Barnes

Metaptera gracilis Barnes. Stimpson, New Eng. Shells. 1851. p.14. (Lake Champlain)

Unio gracilis Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio gracilis Barnes. Beauchamp, Onondaga List. 1886. p.7

Unio gracilis Barnes. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Lampsilis gracilis Barnes. Simpson, Nat. Mus. Proc. 1900. 22:573

Lampsilis laevissimus Lea

Lampsilis laevissimus Lea. Simpson, Nat. Mus. Proc. 1900. 22:574. (Western New York)

Lampsilis leptodon Rafinesque

Lampsilis leptodon Raf. Simpson, Nat. Mus. Proc. 1900. 22:575. (Buffalo)

Genus OBOVARIA Rafinesque

Obovaria leibii Lea

Unio leibii Lea. Beauchamp, Onondaga List. 1886. p.7. (Onondaga lake)

Obovaria leibii Lea. Simpson, Nat. Mus. Proc. 1900. 22:601. (Lake Erie)

Obovaria ellipsis Lea

Unio ellipsis Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Obovaria ellipsis Lea. Simpson, Nat. Mus. Proc. 1900. 22:602

Genus PLAGIOLA Rafinesque

Plagiola elegans Lea

Unio elegans Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Plagiola elegans Lea. Simpson, Nat. Mus. Proc. 1900. 22:604

Genus PTYCHOBRANCHUS Simpson

Ptychobranchus phaseolus Hildrith

Unio phaseolus Hild. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Ptychobranchus phaseolus Hild. Simpson, Nat. Mus. Proc. 1900. 22:612

Genus STROPHITUS Rafinesque

Strophitus edentulus Say

Anodon edentula Say. DeKay, Nat. Hist. N. Y. 1843. p.201 (Lake Onondaga)

Anodon unadilla DeK. DeKay, Nat. Hist. N. Y. 1843. p.199. (Otsego river)

Anodonta edentula Say. Aldrich, Troy List. 1867. p.2. (Northern canal)

Anodonta edentula Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142. (Genesee river)

Anodonta edentula Say. Beauchamp, Onondaga List. 1886. p.8.

Anodonta edentula Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Long pond)

Strophitus edentula Say. Simpson, Nat. Mus. Proc. 1900. 22:616

Strophitus edentulus var. **pavonius** Lea

Anodon pavonia Lea. DeKay, Nat. Hist. N. Y. 1843. p.203. (Onondaga lake)

Anodonta pavonia Lea. Beauchamp, Onondaga List. 1886. p.8. (Erie canal)

Strophitus edentulus var. pavonius Lea. Simpson, Nat. Mus. Proc. 1900. 22:617

Strophitus undulatus Say

Anodonta undulata Say. Jay, Cat. 1852. p.73

Anodonta undulata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta undulata Say. Beauchamp, Onondaga List. 1886. p.8
Anodonta undulata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:18
Strophitus undulatus Say. Simpson, Nat. Mus. Proc. 1900. 22:618

Genus ANODONTA Lamarck

Anodonta cataracta Say

Anodon fluviatilis Dillw. DeKay, Nat. Hist. N. Y. 1843. p.203
Anodonta cataracta Say. Jay, Cat. 1852. p.71
Anodonta fluviatilis Dillw. Aldrich, Troy List. 1867. p.2
Anodonta fluviatilis Dillw. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142
Anodonta fluviatilis Dillw. Beauchamp, Onondaga List. 1886. p.8
Anodonta williamsii Lea. Beauchamp, Onondaga List. 1886. p.8. (Seneca river)
Anodonta fluviatilis Dillw. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Genesee river)
Anodonta cataracta Say. Simpson, Nat. Mus. Proc. 1900. 22:631

Anodonta marginata Say

Anodonta marginata Say. Jay, Cat. 1852. p.72
Anodonta lacustris Lea. Lea, Obs. Genus Unio. 1860. 8:45. (Little and Crooked lakes)
Anodonta fragilis Lam. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142
Anodonta lacustris Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142
Anodonta fragilis Lam. Beauchamp, Onondaga List. 1886. p.8
Anodonta lacustris Lea. Beauchamp, Onondaga List. 1886. p.8
Anodonta fragilis Lam. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Pittsford)
Anodonta marginata Say. Simpson, Nat. Mus. Proc. 1900. 22:632

Anodonta implicata Say

Anodonta implicata Say. DeKay, Nat. Hist. N. Y. 1843. p.202
Anodonta excurvata DeK. DeKay, Nat. Hist. N. Y. 1843. p.202. (Albany county)
Anodonta implicata Say. Aldrich, Troy List. 1867. p.2
Anodonta implicata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta implicata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Charlotte)

Anodonta excurvata DeK. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Pittsford)

Anodonta implicata Say. Simpson, Nat. Mus. Proc. 1900. 22:633

Anodonta imbecillis Say

Anodonta imbecillis Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta imbecillis Say. Beauchamp, Onondaga List. 1886. p.8

Anodonta imbecillis Say. Walton, Rochester Acad. Sci. 1892. 2:17. (Irondequoit)

Anodonta imbecillis Say. Simpson, Nat. Mus. Proc. 1900. 22:635

Anodonta grandis Say

Anodonta lewisii Lea. Lea, Obs. Genus Unio. 1860. 8:44. (Erie canal and Genesee river)

Anodonta lewisii Lea. Aldrich, Troy List. 1867. p.2. (Mohawk basin)

Anodonta lewisii Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta lewisii Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta salmonia Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta lewisii Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:17

Anodonta salmonia Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:17

Anodonta grandis Say. Simpson, Nat. Mus. Proc. 1900. 22:641

Anodonta grandis var. footiana Lea

Anodonta footiana Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta footiana Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta grandis var. footiana Lea. Simpson, Nat. Mus. Proc. 1900. 22:642

Anodonta grandis var. gigantea Lea

Anodon plana Lea. DeKay, Nat. Hist. N. Y. 1843. p.201. (Lake Ontario)

Anodonta decora Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta grandis var. gigantea Lea. Simpson, Nat. Mus. Proc. 1900. 22:643

Anodonta grandis var. benedictensis Lea

Symphynota benedictensis Lea. Lea, Obs. Genus Unio. 1834. 1:216

Anodon benedictensis Lea. DeKay, Nat. Hist. N. Y. 1843. p.204. (Lakes Onondaga and Champlain)

Alasmodonta benedictensis Lea. Stimpson, New Eng. Shells. 1851. p.15. (Lake Champlain)

Anodonta benedictensis Lea. Jay, Cat. 1852. p 71. (Lake Champlain)

Anodonta benedictensis Lea. Aldrich, Troy List. 1867. p.2. (Mohawk and Hudson rivers)

Anodonta benedictii Lea Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142. (Lake Champlain)

Anodonta benedictii Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta benedictii Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Erie canal)

Anodonta grandis var. benedictensis Lea. Simpson, Nat. Mus. Proc. 1900. 22:644

Anodonta kennicottii Lea

Anodonta simpsoniana Lea. Beauchamp, Onondaga List. 1886. p.8. (Beaver lake)

Anodonta kennicottii Lea. Simpson, Nat. Mus. Proc. 1900. 22:647

Anodonta pepiniana Lea

Anodonta pepiniana Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta pepiniana Lea. Simpson, Nat. Mus. Proc. 1900. 22:647

Genus ANODONTOIDES Simpson

Anodontoides ferussacianus Lea

Anodon ferussaciana Lea. DeKay, Nat. Hist. N. Y. 1843. p.200. (Erie canal)

Anodonta ferussaciana Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142. (Genesee river)

Anodonta ferussaciana Lea. Beauchamp, Onondaga List. 1886. p.8. (Erie canal)

Anodonta ferussaciana Lea. Walton, Rochester Acad. Sci. Proc. r892. 2:17. (Erie canal)

Anodonta ferruginea Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Genesee river)

Anodontoides ferussacianus Lea. Simpson, Nat. Mus. Proc. 1900. 22:659

Anodontoides ferussacianus var. **subcylindraceus** Lea

Anodonta subcylindracea Lea. Lea, Obs. Genus Unio. 1838. 2:106. (Orleans county)

Anodon subcylindracea Lea. DeKay, Nat. Hist. N. Y. 1843. p.200. (Oswego river)

Anodonta subcylindracea Lea. Jay, Cat. 1852. p.73. (Orleans county)

Anodonta subcylindracea Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.142

Anodonta subcylindracea Lea. Beauchamp, Onondaga List. 1886. p.8

Anodonta subcylindracea Lea. Walton, Rochester Acad. Sci. Proc. 2. 1892. p.17. (Irondequoit)

Anodontoides ferussacianus var. subcylindraceus Lea. Simpson, Nat. Mus. Proc. 1900. 22:660

Anodontoides ferussacianus var. **modestus** Lea

Anodontoides ferussacianus var. modestus Lea. Simpson, Nat. Mus. Proc. 1900. 22:660

Genus SYMPHYNOTA Lea

Symphynota compressa Lea

Symphynota compressa Lea. Lea, Obs. Genus Unio. 1834. 1:64. (Near Albany)

Unio compressus Lea. DeKay, Nat. Hist. N. Y. 1843. p.191. (Orleans and Jefferson counties)

Unio compressus Lea. Jay, Cat. 1852. p.57

Unio pressus Lea. Aldrich, Troy List. 1867. p.2. (Hoosic river)

Unio pressus Lea. Lewis. Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141. (Owasco lake)

Unio pressus Lea. Beauchamp, Onondaga List. 1886. p.7. (Seneca river)

Unio pressus Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Genesee river)

Symphynota compressa Lea. Simpson, Nat. Mus. Proc. 1900. 22:662

Symphynota compressa var. plebius Adams

Symphynota compressa var. plebius Ads. Simpson, Nat. Mus. Proc. 1900. 22:663. (Hudson river)

Symphynota viridis Conrad

Unio tappanianus Lea. DeKay, Nat. Hist. N. Y. 1843. p.194. (Northern canal)

Unio tappanianus Lea. Aldrich, Troy List. 1867. p.1 (Northern canal)

Unio tappanianus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio tappanianus Lea. Beauchamp, Onondaga List. 1886. p.7. (Erie canal and Seneca river)

Unio tappanianus Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Genesee river)

Symphynota viridis Conr. Simpson, Nat. Mus. Proc. 1900. 22:663

Symphynota costata Rafinesque

Alasmodon rugosa Barnes. DeKay, Nat. Hist. N. Y. 1843. p.196

Margaritana rugosa Lea. Aldrich, Troy List. 1867. p.2. (Mohawk basin)

Margaritana rugosa Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Margaritana rugosa Barnes. Beauchamp, Onondaga List. 1886. p.7. (Onondaga lake)

Margaritana rugosa Barnes. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Genesee river)

Symphynota costata Raf. Simpson, Nat. Mus. Proc. 1900. 22:665

Symphynota complanata Barnes

Symphynota complanata Barnes. Simpson, Nat. Mus. Proc. 1900. 22:665

Genus ALASMIDONTA Say

Alasmidonta undulata Say

Alasmodon undulata Say. DeKay, Nat. Hist. N. Y. p.198. (Albany county)

Margaritana undulata Say. Jay, Cat. 1852. p.69

Margaritana undulata Lea. Aldrich, Troy List. 1867. p.2. (Northern canal)

Margaritana undulata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Margaritana undulata Say. Beauchamp, Onondaga List. 1886. p.8. (Erie canal)

Alasmidonta undulata Say. Simpson, Nat. Mus. Proc. 1900. 22:667

Alasmidonta calceola Lea

Margaritana deltoidea Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:17. (Erie canal)

Alasmidonta calceola Lea. Simpson, Nat. Mus. Proc. 1900. 22:668

Alasmidonta calceola Lea. Letson, N. Y. State Mus. Bul. 45. 1901. p.250. (Goat island. Post-Pliocene)

Alasmidonta heterodon Lea

Unio heterodon Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Alasmidonta heterodon Lea. Simpson, Nat. Mus. Proc. 1900. 22:669

Alasmidonta marginata Say

Alasmodon marginata Say. DeKay, Nat. Hist. N. Y. 1843. p 196

Alasmodon corrugata DeKay. DeKay, Nat. Hist. N. Y. 1843. p.198

Margaritana marginata Say. Jay, Cat. 1852. p.69

Margaritana marginata Say. Aldrich, Troy List. 1867. p.2. (Northern canal)

Margaritana marginata Say. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Margaritana marginata Say. Beauchamp, Onondaga List. 1886. p.7

Margaritana marginata Say. Walton, Rochester Acad. Sci. Proc. 1892. 2:17 (Erie canal)

Alasmidonta marginata Say. Simpson, Nat Mus. Proc. 1900. 22:670

Alasmidonta truncata B. H. Wright

Alasmidonta truncata Wright. Simpson, Nat. Mus. Proc. 1900. 22:671

Genus HEMILASTENA Agassiz

Hemilastena ambigua Say

Margaritana hildrethiana Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141. (Buffalo creek)

Hemilastena ambigua Say. Simpson, Nat. Mus. Proc. 1900. 22:673

Genus MARGARITANA Schumacher

Margaritana margaritifera Linnaeus

Alasmodon arcuata Barnes. DeKay, Nat. Hist. N. Y. 1843. p.197. (Rockland and Oneida counties)

Margaritana margaritifera Linn. Jay, Cat. 1852. p.69. (Lake Erie)

Margaritana margaritifera Linn. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Margaritana margaritifera Linn. Beauchamp, Onondaga List. 1886. p.8. (Oneida lake)

Margaritana margaritifera Linn. Simpson, Nat. Mus. Proc. 1900. 22:674

Genus UNIO Retzius

Unio pictorum Linnaeus

Unio ovalis Flem. Jay, Cat. 1852. p.63. (Lake Champlain)

Unio nodulosus Lam. Jay, Cat. 1852. p.62. (Lake Champlain)

Unio pictorum Linn. Simpson, Nat. Mus. Proc. 1900. 22:680

Unio gibbosus Barnes

Unio gibbosus Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio gibbosus Barnes. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Erie canal)

Unio gibbosus Barnes. Simpson, Nat. Mus. Proc. 1900. 22:703

Unio gibbosus Barnes. Letson, N. Y. State Mus. Bul. 45. 1901. p.251. (Goat island. Post-Pliocene)

Unio complanatus Solander

Unio complanatus Sol. DeKay, Nat. Hist. N. Y. 1843. p.188. (Little Falls, Oak Orchard)

Unio complanatus Sol. Jay, Cat. 1852. p.56. (Lake Champlain, Hudson river and Lake George)

Unio rarisulcata Lam. Jay, Cat. 1852. p.65. (Lake Champlain)

Unio purpurascens Lam. Jay, Cat. 1852. p.64

Unio georgina Lam. Jay, Cat. 1852. p.59. (Lake George)

Unio rhombula Lam. Jay, Cat. 1852. p.65. (Hudson river)

Unio fluviatilis Green. Jay, Cat. 1852. p.59

Unio complanatus Sol. Aldrich, Troy List. 1867. p.1

Unio complanatus Sol. Lewis, Buf. Soc. Nat. Sci. Bul. 1874. 2:141

Unio complanatus Sol. Beauchamp, Onondaga List. 1886. p.7

Unio complanatus Sol. Walton, Rochester Acad. Sci. Proc. 1892. 2:15. (Genesee river)

Unio complanatus Sol. Simpson, Nat. Mus. Proc. 1900. 2:720

Genus QUADRULA Rafinesque

Quadrula plicata hippopaea Lea

Unio hippopaeus Lea. Lea, Obs. Genus Unio. 1841. 4:41. (Lake Erie)

Unio hippopaeus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141. (Buffalo river)

Quadrula plicata hippopaea Lea. Simpson, Nat. Mus. Proc. 1900. 22:767. (Lake Erie)

Quadrula undulata Barnes

Unio undulatus Barnes. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio undulatus Barnes. Beauchamp, Onondaga List. 1886. p.7. (Erie canal)

Unio undulatus Barnes. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Erie canal)

Quadrula undulata Barnes. Simpson, Nat. Mus. Proc. 1900. 22:769

Quadrula lachrymosa Lea

Quadrula lachrymosa Lea. Simpson, Nat. Mus. Proc. 1900. 22:776

Quadrula pustulosa Lea

Unio pustulatus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Quadrula pustulosa Lea. Simpson, Nat. Mus. Proc. 1900. 22:779

Quadrula rubiginosa Lea

Unio rubiginosus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Unio rubiginosus Lea. Beauchamp, Onondaga List. 1886. p.7. (Erie canal)

Unio rubiginosus Lea. Walton, Rochester Acad. Sci. Proc. 1892. 2:16. (Genesee river)

Quadrula rubiginosa Lea. Simpson, Nat. Mus. Proc. 1900. 22:786

Quadrula trigona Lea

Unio trigonus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p.141

Quadrula trigona Lea. Simpson, Nat. Mus. Proc. 1900. 22:787

Quadrula coccinea Conrad

Unio coccineus Lea. Lewis, Buf. Soc. Nat. Sci. Bul. 2. 1874. p 141

Quadrula coccinea Conr. Simpson, Nat. Mus. Proc. 1900. 22:788

Quadrula coccinea Conr. Letson, N. Y. State Mus. Bul. 45. 1901. p. 252. (Goat island. Post-Pliocene)

Quadrula coccinea paupercula Simpson

Quadrula coccinea paupercula Simp. Simpson, Nat. Mus. Proc. 1900. 22:789

Quadrula tuberculata Rafinesque

Unio verrucosus Barnes. Jay, Cat. 1852. p.68. (Lake Erie)

Quadrula tuberculata Raf. Simpson, Nat. Mus. Proc. 1900. 22:795

Quadrula solida Lea

Quadrula solida Lea. Letson, N. Y. State Mus. Bul. 45. 1901. p.251. (Goat island. Post-Pliocene)

Family NUCULIDAE

Genus NUCULA Lamarck

Nucula proxima Say

Nucula proxima Say. DeKay, Nat. Hist. N. Y. 1843. p.179

Nucula proxima Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:385

Nucula radiata DeKay

Nucula radiata DeK. DeKay, Nat. Hist. N. Y. 1843. p.179. (Williamsburg, East river)

Nucula radiata DeK. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (East river)

Genus YOLDIA Möller

Yoldia limatula Say

Leda limatula St. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (New York bay)

Yoldia limatula Say. Verrill & Bush, Am. Jour. Sci. 1897. ser. 4. 3:55

Yoldia gouldi DeKay

Nucula gouldi DeK. DeKay, Nat. Hist. N. Y. 1843. p.180. (Long Island sound)

Leda gouldi DeK. Smith & Prime, An. Lyc. N. Y. 1870. 9:385

Yoldia gouldi DeK. Verrill, U. S. Fish Com. Rep't. 1871-72. p.690

Yoldia sapotilla Gould

Leda sapotilla St. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (Greenport)

Yoldia sapotilla Gould. Verrill & Bush, Am. Jour. Sci. 1897. ser. 4. 3:55

Nucula sapotilla Gould. Carpenter, Naut. 1901. 15:92. (Long Island sound)

Genus MEGAYOLDIA

Megayoldia thraciaeformis Storer

Nucula thraciaeformis Str. DeKay, Nat. Hist. N. Y. 1843. p.178

Leda thraciaeformis Str. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (Fire Island light)

Magayoldia thraciaeformis Str. Verrill & Bush, Am. Jour. Sci. 1897. ser. 4. 3:55.

Family ARCIDAE

Genus ARCA Linnaeus

Arca pexata Say

Arca pexata Say. DeKay, Nat. Hist. N. Y. 1843. p.176

Arca pexata Say. Jay, Cat. 1852. p.50

Arca pexata Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:385

Arca pexata Say. Carpenter, Naut. 1901. 15:93. (Long Island sound)

Arca ponderosa Say

Arca ponderosa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (Fire Island light)

Arca ponderosa Say. Verrill, Ct. Acad. Arts & Sci. 1882. 5:573

Arca transversa Say

Arca transversa Say. DeKay, Nat. Hist. N. Y. 1843. p.177

Arca transversa Say. Jay, Cat. 1852. p.51.

Arca transversa Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:384

Family MYTILIDAE

Genus MYTILUS Linnaeus

Mytilus edulis Linnaeus

Mytilus borealis Lam. DeKay, Nat. Hist. N. Y. 1843. p.182. (Long Island sound)

Mytilus notatus DeK. DeKay, Nat. Hist. N. Y. 1843. p.182

Mytilus pellucidus DeK. DeKay, Nat. Hist. N. Y. 1843. p.183

Mytilus pellucidus Maton. Jay, Cat. 1852. p.77
Mytilus edulis Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:386

Mytilus corrugatus Stimpson

Mytilus corrugatus St. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (Gardiners bay)

Mytilus hamatus Say

Mytilus hamatus Say. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (New York harbor)

Genus MODIOLUS Lamarck

Modiolus modiolus Linnaeus

Modiola modiolus Linn. DeKay, Nat. Hist. N. Y. 1843. p.185
Mytilus modiolus Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:386. (Greenport)

Modiolus demissus plicatulus Lamarck

Modiola plicatula Lam. DeKay, Nat. Hist. N. Y. 1843. p.184
Modiola plicatula Lam. Jay, Cat. 1852. p.77
Mytilus plicatulus Desh. Smith & Prime, An. Lyc. N. Y. 1870. 9:386

Subfamily CRENELLINAE

Genus CRENELLA Brown

Crenella grandula Totten

Crenella decussata Mont. DeKay, Nat. Hist. N. Y. 1843. p.186
Mytilus decussatus Mont. Smith & Prime, An. Lyc. N. Y. 1870. 9:385. (Gardiners bay)
Crenella grandula Tott. Carpenter, Naut. 1901. 15:106. (Long Island sound)

Family PECTINIDAE

Genus PECTEN Müller

Pecten gibbus irradians Lamarck

Pecten concentricus Say. DeKay, Nat. Hist. N. Y. 1843. p.172
Pecten concentricus Say. Jay, Cat. 1852. p.84
Pecten irradians Lam. Jay, Cat. 1852. p.85
Pecten turgidus Sowb. Jay. Cat. 1852. p.87
Pecten irradians Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9:384. (Long Island sound)

Pecten tenuicostatus Mighels and Adams

Pecten magellanicus Gmel. DeKay, Nat. Hist. N. Y. 1843. p.173. (Sandy Hook)

Pecten magellanicus Gmel. Smith & Prime, An. Lyc. N. Y. 1870. 9:384. (Long Island sound)

Pecten tenuicostatus M. & A. Carpenter, Naut. 1901. 15:114. (Long Island sound)

Pecten islandicus Müller

Pecten islandicus Müll. DeKay, Nat. Hist. N. Y. 1843. p 173

Family ANOMIIDAE

Genus ANOMIA Linnaeus

Anomia aculeata Gmelin

Anomia aculeata Müll. Jay, Cat. 1852. p.92

Anomia ephippium aculeata Gmel. Smith & Prime, An. Lyc. N. Y. 1870. 9:384.

Anomia aculeata Gmel. Carpenter, Naut. 1901. 15:130. (Long Island sound)

Anomia glabra Verrill

Anomia ephippium Linn. DeKay, Nat. Hist. N Y. 1843. p.168

Anomia ephippium Linn. Jay, Cat. 1852. p.92

Anomia patellaris Lam. Jay, Cat. 1852. p.92

Anomia ephippium Linn. Smith & Prime, An. Lyc. N. Y. 1870. 9:384

Anomia glabra Verr. Carpenter, Naut. 1901. 15:130

Family OSTREIDAE

Genus OSTREA Linnaeus

Ostrea borealis Lamarck

Ostrea borealis Lam. DeKay, Nat. Hist. N. Y. 1843. p.169

Ostrea borealis Lam. Jay, Cat. 1852. p.89

Ostrea canadensis Burg. Jay, Cat. 1852. p.89

Ostrea borealis Lam. Smith & Prime, An. Lyc. N. Y. 1870. 9:384

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Bulletin 91

ZOOLOGY 12

HIGHER CRUSTACEA OF NEW YORK CITY

BY

FREDERICK C. PAULMIER Ph.D.

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New York State Education Department

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Bulletin 91

ZOOLOGY 12

HIGHER CRUSTACEA
OF
NEW YORK CITY

PREFACE

During the last few years the bulletins by Gerrit S. Miller jr, Tarleton H. Bean, Edwin C. Eckel and F. C. Paulmier have given facilities for the identification of the mammals, fish, reptiles and batrachians of the State, and a descriptive catalogue of the birds is already under way. In order to continue this series, Dr Paulmier, Assistant in Zoology, is preparing a catalogue of the Crustacea of New York.

The greater part of the State not having yet been worked over, it seemed best to confine the first list of Crustacea to the fauna of a limited area, and the present city of Greater New York appeared to be one well suited to the purpose, both on account of its varied geographic conditions, and because a large proportion of the people who need to use any but a catalogue of the purely fresh-water or land forms are to be found there.

As the preparation of the complete catalogue will occupy considerable time, it is thought advisable to issue as bulletins, as soon as prepared, the parts dealing with the separate groups. The present part relates to the higher Crustacea.

F. J. H. Merrill

INTRODUCTION

In these days of nature study in the schools and elsewhere, attention is chiefly paid to a few striking groups, the birds apparently being the forms most favored. Invertebrates with the exception of mollusks and insects, are receiving very little attention, though there is a wealth of material awaiting the patient investigation of their life histories and habits.

One of the evident reasons for this is the lack of facilities for easily identifying the forms collected. The literature of the subject is large, though much of it consists of mere verbal description, and only a part of the species have been figured. Much of it too, is usually inaccessible except to those within reach of large libraries.

The group of which the present catalogue treats, the malacostracous Crustacea, perhaps suffers less from this deficiency than some others, for many of the forms are large and conspicuous and have been frequently brought to public notice. It is true also that keys to the greater part of this group have been recently published, but it is the belief of the writer that, even with the best of keys, the inexperienced observer has difficulty in identifying members of large groups without the aid of illustration.

It is with the hope of partly remedying this deficiency that this catalogue has been prepared, and figures of all the species taken within the city limits are here given. It is not complete; the collecting has not yet been extensive enough to include all the forms that occur. Still over 60 species have been taken, either within the city limits or at localities near by where the conditions are sufficiently similar to warrant the certainty that they will be found within the area under discussion.

Descriptions of the species have been made as brief as practicable and only the most salient and characteristic marks given. In the Decapoda, where the families are represented by but one or two genera, the diagnosis of the family has been omitted, that of the tribe being thought sufficient. In the Arthrostraca, on the other hand, short diagnoses of the families represented have been presented.

Besides the descriptions, short notes on the station and mode of life of the species are given and also, for what appear to be the rarer forms, the exact locality where taken. As the whole city has not yet been worked over it is to be remembered that many of the species here assigned to restricted localities will be found wherever the conditions are suitable.

Many of the cuts in the work have been copied from various papers by Rathbun, Verrill, Harger and others; the remainder of the figures were drawn by the writer.

The author's thanks are due to Professors Wilson and Dean, for their kindness in offering the use of the laboratory of the department of zoology, Columbia University, and to Professor Crampton for the facilities of the Columbia Laboratory at Bay Shore; also to Prof. S. J. Holmes who has kindly identified some Amphipoda, and to other zoologists who have given advice and encouragement.

It is hoped that this catalogue will serve to stimulate the interest in this group of the Crustacea. The writer will be glad to receive notes as to the occurrence of any species, and will be pleased to identify any forms that may be sent to the State Museum.

DESCRIPTION AND DEFINITION OF THE PHYLUM ARTHROPODA

As a preliminary to the catalogue it may be well to give some definition and explanation of the division to which the class described belongs and of the class itself. This great division, or phylum, is characterized by bilateral symmetry as in the lower phylum, the Annulata or worms, and as in that group the body is divided into segments. An advance over the Annulata, however, is in the presence of jointed appendages attached to the segments and from this circumstance it has received the name Arthropoda (Greek ἄρθρον, a joint, πούς foot).

The Arthropoda are divided into five classes:

1 Crustacea, including lobsters, shrimps, crabs, barnacles, water fleas etc.

2 Onychophora, with only one genus, Peripatus

3 Myriopoda: centipedes and millipedes

4 Insecta: insects

5 Arachnida: spiders, scorpions, mites etc.

A part of the Crustacea are treated in the present catalogue.

The name Crustacea implied to early zoologists an animal with a hard but flexible shell, in distinction from the Testacea in which the shell was hard and brittle, as in the clam or oyster. The insects and other groups have, however, a hard and flexible shell, so that this will not serve as a distinction.

On comparing the classes we find that a much greater portion of the Crustacea than of the other groups is aquatic and the breathing apparatus is of a different character. The insects, myriopods and Peripatus breathe through a series of tubes or tracheae, which carry the air to all parts of the body, while in the Crustacea there are no tracheae and the blood becomes aerated either in certain localized regions, the gills, or else over the general body surface.

In completing the definition of the class it would be well for the student to have before him some more or less familiar crustacean and examine its structure.

Take then the crayfish or lobster, which differ but little from each other and are common though they can not be called typical Crustacea in the sense that they exhibit crustacean characters in their simplest form.

First, we observe that the body is segmented. This is not so obvious in the anterior part of the crayfish, for the head and thorax are fused together into a cephalothorax, which is covered by a fold of the integument, the carapace. The presence of appendages shows, however, that this part of the body is composed of segments fused together. The abdomen is distinctly segmented.

The cephalic region or head in the crayfish, as in all Crustacea, is composed of a prostomium and five segments, all indistinguishably fused. It bears two pairs of feelers, the anterior of which are known as the antennulae and the posterior as the antennae. Then follow a pair of eyes, stalked, in the order to which the crayfish belongs. On the underside of the head are the mouth parts which consist of a pair of mandibles or jaws and two pairs of maxillae.

If the second pair of maxillae be examined carefully, it will be found that they are biramous, that is consist of a basal joint which bears two rami or branches, known respectively as exopodite and endopodite. This may be termed the typical form of a crustacean limb, but it is often modified by the loss of one of the rami, the exopodite. This is true of the mandibles and the first maxilla.

The thoracic region, which follows and which, as mentioned above, in the crayfish is fused with the head, bears eight pairs of appendages. Of these the first three are comparatively small, are biramous, function as accessory mouth parts and are known as maxillipeds. The next five pairs are large with only a single branch representing the endopodite and serve as the walking legs. The first pair of them are largest and the penultimate joint is produced distally to form a projection against which the ultimate joint bites, thus forming a claw or chela. The next two pairs are chelate also, while the last two are simple.

To the bases of these appendages are attached long plumose hollow gills which are covered over and protected by the carapace. Another set of gills is also attached to the inner wall of this chamber directly above the preceding.

The appendages of the third, fourth and fifth segments of the abdomen are biramous and delicate and are used to aid in swimming, and by the female as a place of attachment for the eggs. The sixth pair are also biramous but are broad and flattened and together with the last joint or telson (which is without appendages) form a fanlike tail fin. With the aid of this and by suddenly bending the body, the crayfish can give a swift leap backward through the water.

The appendages of the second abdominal appendage in the female, and of the first and second of the male, are modified into genital organs.

Examine now another form of Crustacea, less familiar than the crayfish or lobster, but exhibiting the crustacean characters in greater simplicity: the common fresh-water amphipod, *Gammarus fasciatus*, found everywhere in fresh-water ponds. One of the

beach fleas or one of the common salt-water Gammarids will do as well.

In this form [fig. 1] the fusion of the segments has not taken place to the extent that it has in the crayfish. The head consists of the prostomium and five fused segments, and to them is added

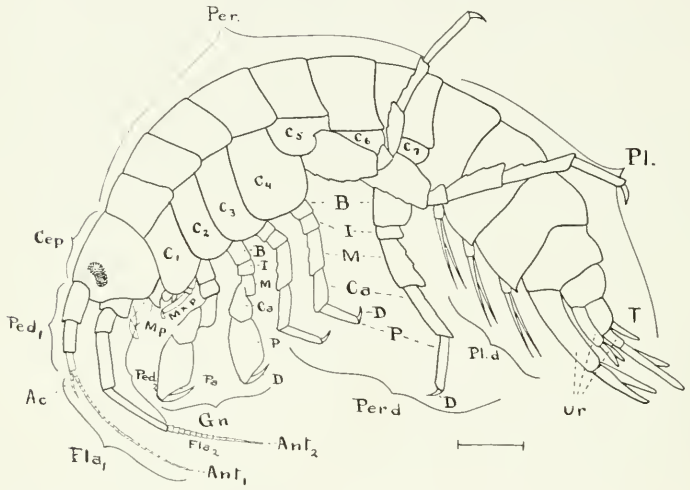

Fig. 1 Diagram of Gammarus fasciatus

Divisions of body: *Cep*=cephalon or head; *Per.*=pereion, thorax or mesosome; *Pl*=pleon, abdomen (the first three segments of this are sometimes called the metasome, the last three urosome)

Appendages of cephalon: Ant_1=antennula or superior antenna; Ped_1=peduncle; Fl_1=flagellum; *Ac*=accessory or secondary flagellum; Ant_2=antenna or inferior antenna; Ped_2=peduncle; Fl_2=flagellum; *M. p*=mandibular palp; *Mx. p*=maxilliped

Appendages of pereion: Gn_1=first gnathopod; Gn_2=second gnathopod; *Per.d*=pereiopoda

Joints in all the legs: *C*=coxa; *B*=basus; *I*=ischium; *M*=merus; *Ca*=carpus; *P*=propodus; *D*=dactylus; *Pa*=palm of gnathopod

Appendages of pleon: *Pl.d*=pleopoda; *Ur*=uropoda; *T*=telson

|———| = length of animal from front of head to end of terminal uropod ♂=male ♀=female

one thoracic segment, but there is no carapace. The remainder of the segments are all free.

The head bears a pair of sessile eyes, that is eyes without a stalk, a pair of antennulae [Ant_1] and a pair of antennae [Ant_2]. Each of these consists of a peduncle [*Ped*] of three and four joints respectively and a flagellum [*Fla*] of many joints. In addition to this, the antennulae bear a very short accessory flagellum [*Ac*]. The mouth parts are quite similar to those of the crayfish, consisting of mandibles and two pairs of maxillae. The mandibles in the Amphi-

poda may or may not bear a jointed appendage known as a palp [*M. p*]. This is frequently of value in determining the species, and when present, either it appears projecting as in the figure, or, frequently in alcoholic specimens, the end of it may be seen between the bases of the antennulae.

As only one thoracic segment is fused with the head, there is but one maxilliped [*Mx. p*], which is small.

The seven following segments constitute the thorax or pereion [*Per*]. Its first two pairs of appendages, corresponding to the second and third maxillipeds of the crayfish, are large and known as gnathopoda [*Gn*]. They consist, as do the following five pairs of legs, of six joints attached to a base plate, the coxa [*C* 1–7]. The six joints beginning at the proximal end are named basus [*B*], ischium [*I*], merus [*M*], carpus [*Ca*], propodus [*P*] and dactylus [*D*]. The ultimate joint, the dactylus, is bent back on the propodus so as to form a sort of chela, or, as it is termed, a subchela.

The next five pairs of legs are the pereiopoda. The first two are of moderate size and the last three are larger and adapted for leaping or walking.

The last six segments are the abdomen or pleon [*Pl*]. The three anterior of them are larger than the rest and bear delicate biramous appendages, the pleopoda [*Pl. d*], which function as swimming organs. The last three appendages are the uropoda [*Ur*] and are biramous, stout and assist in leaping.

The last pair of them, known as the terminal uropoda, differ frequently in other species, from the preceding pairs and afford valuable diagnostic characters. The terminal segment of the body, the telson [*T*], as in the crayfish, has no appendages and is small. It also varies greatly in the different species.

The breathing organs of this group are in the form of lamellar sacs attached to the bases of the pereiopoda.

The eggs are carried in a brood pouch formed of plates attached to the pereion of the female.

Comparing now the two forms, we see that, in spite of their dissimilar appearance, they are composed of the same elements, though the elements may be greatly modified for different purposes. These

modifications are carried out in every direction and form the basis for the division into orders, families, genera and species.

It is certain too that in no other group of animals are there such wide deviations from what may be regarded as a typical form, such as the second one described above, or such extreme modifications in adaptation to particular or special modes of life. It may even be carried to the extent of the entire loss of all crustacean characters, as in Sacculina, a parasite on a crab, where in the adult there is no sign of segmentation, no appendages, no mouth, just a sac with a number of rootlike filaments extending through the body of the host. It is only by its developmental history that we know it to be a crustacean.

This variation takes place to a certain extent even within the groups of closely related forms which are regarded as a tribe or a family and explains the frequent use of the words "usually" or "generally" in the diagnoses, or the terms "with or without" a certain part.

The sexes in the Crustacea are usually separate, and the eggs are carried by the female either in a brood pouch or attached to the limbs. The young, in most cases, hatch in a free swimming form so unlike the parent that formerly they were regarded as distinct species. This larva grows by a series of molts whereby it gradually increases in size and attains the adult form. In other words there is indirect development or a metamorphosis.

In other cases, such as in the crayfishes and the Arthrostaca, the young are very like the parent, differing only in small details, and the development is direct.

Owing to the hardness of the integument, which is incapable of growth, increase in size in the Crustacea is obtained by the shedding of the hard shell and the formation of a new one underneath. This new one is soft and thus allows a certain increase in size, but it soon hardens. A familiar example of this soft condition after molting is seen in the "soft shell crab."

The Crustacea as a class may be regarded as holding a very similar place in the economy of the ocean to that of the insects on the land. Like the insects, they are widely distributed, hardly any place being

without its representatives, modified to suit the conditions. Minute forms belonging to the lower orders swarm at the surface of the ocean and together with the young of the higher orders, form an important supply of food for fishes and other animals. Other similar species inhabit fresh water, and no roadside pool is without them. Crawling over the bottoms of the bays and sounds, or buried in the sand or mud, other varieties, usually larger and belonging to the higher orders, may be found, while along the shores, under stones or heaps of debris or rockweed, or living among the algae on piles, or even in the piles themselves, are many others.

Some also have been modified for a terrestrial life and may even be said to have become domesticated; for certain of the sow-bugs are rarely to be found except in the vicinity of human habitations.

A few of the leading forms have been made use of directly as food, but the economic importance of the group as a whole is mainly indirect.

The literature of the group is very extensive and dates back to early times, though the early papers were of but little importance. Even as late as 1840 it was still possible for Milne-Edwards to write a *Histoire naturelle des Crustaces* and tell practically all that was known concerning them, but the group has now grown far beyond such bounds and most of the works deal with orders or smaller groups. Consequently the greater part of the literature had best be given under the heads of the different orders, but the following general works may be mentioned here.

De Kay, J. E. Zoology of New York. pt6 Crustacea. Alb. 1844.

Milne-Edwards, A. Histoire naturelle des Crustaces. Par. 1834–40.

Rathbun, R. Fisheries and Fishery Industries of the United States. Sec.1, pt5. Wash. 1884.

Economic and food values of Crustacea.

Sars, G. O. An Account of the Crustacea of Norway. Christiania and Copenhagen. 1895——.

Diagnoses of families etc., with short descriptions and figures of the species; not yet completed.

Say, Thomas. An Account of the Crustacea of the United States. Acad. Nat. Sci. Phila. Jour. 1817–18. v.1.

The first important work on American Crustacea. Gives first descriptions of many common forms.

Smith, S. I. The Stalk-eyed Crustacea of the Atlantic Coast of North America, north of Cape Cod. Ct. Acad. Arts and Sci. Trans. 1878–82. 5:27.

Stebbing, T. R. R. A History of Crustacea, Recent Malacostraca. Internat. Sci. Ser. 71. New York. 1893.

Stimpson, W. Marine Invertebrata of Grand Manan. Smithsonian Contributions to Knowledge, 6. Wash. 1854.

Underwood, L. M. List of the Described Species of Fresh-water Crustacea from America, north of Mexico. Ill. State Lab. Nat. Hist. Bul. 1886. 2:323.

Index of species described to that date with principal references.

Verrill, A. E. Invertebrates of Vineyard Sound. Com. Fish and Fisheries Rep't. Wash. 1874.

Descriptions and accounts of the habits of many common species.

CATALOGUE

The Crustacea are divided into two subclasses: 1 Entomostraca, 2 Malacostraca.

Subclass 1 ENTOMOSTRACA

Crustacea of comparatively simple organization and usually of small size. Except in the parasitic forms and the barnacles the typical crustacean number of head appendages are present, but the thoracic and abdominal appendages are very variable in number and are little differentiated. A large carapace is frequently present, being sometimes in the form of a bivalved shell. The young usually hatch in a very primitive, free-swimming stage known as the nauplius.

But little has been done on this subclass in New York; and it is still far too early to attempt a catalogue of the species.

Subclass 2 MALACOSTRACA

Crustacea, usually of considerable size and more highly organized than those of the preceding subclass. The number of segments is constant, there being (except in one order, not represented in New York) a thorax of eight segments and an abdomen of seven. In all the orders represented here, one or more of the thoracic segments are fused with the head to form a cephalothorax, which in some of the orders is covered by a carapace. The thoracic appendages are more highly differentiated than in the Entomostraca and are often strikingly modified in connection with their various functions. One or more pairs of them usually act as accessory mouth parts and are known as maxillipeds.

With but few exceptions, the nauplius stage, in which the young of the Entomostraca hatch, is passed through in the egg, but except in one order, the young hatch in a form very unlike the parent and thus undergo a metamorphosis.

The members of this group are more familiar to the ordinary observer, as it includes, among others, the crabs, lobsters, crayfish, the beach fleas and the sow-bugs.

The Malacostraca are divided into six orders, of which all but the first are represented in New York city: 1 Phyllocarida, 2 Schizopoda, 3 Decapoda, 4 Stomatopoda, 5 Cumacea, 6 Arthrostraca.

Order 1 PHYLLOCARIDA

Small Malacostraca which have some of the characters of the Entomostraca and form a connecting link between them and the Malacostraca. Head and thorax with malacostracan number of segments, with a bivalved carapace, and with feet leaflike. Abdomen with eight segments, with biramous appendages and a pair of caudal stylets.

The principal genus is Nebalia, and a species of this, N. bipes Fab., is common in the North Atlantic but has not been taken as far south as New York.

Order 2 SCHIZOPODA

Malacostraca in which the thoracic appendages are all biramous, and the anterior ones are only to a slight extent modified as maxillipeds. A thin, soft carapace is present but does not cover the posterior segments. Eyes stalked.

A small group of forms which are known as opossum shrimps, three species of which are found in New York city waters.

Mysis stenolepis Smith

Mysis stenolepis Smith. In Verrill, *l. c.* 1874. p.551.

Body more or less cylindric. Carapace produced into a short, blunt rostrum: inferior angle with a sharp tooth. Antennal scale rather longer than carapace, ciliated; flagellum of antennae as long as body. Abdomen somewhat geniculated between first and second segments. Inner lamellae of the sixth segment slightly longer than telson.

Length: male 23 mm, female 30 mm. Color white, marked with black pigment spots, somewhat stellate in form.

Very common in the eelgrass in Great South bay.

Two other species of Schizopoda will probably be found, both smaller than the preceding. Mysis americana Smith, measures 10–12 mm and the antennal scale is but three quarters the length of the carapace. The inner lamella of the sixth abdominal segment is as long as the telson. Found among eelgrass.

Heteromysis formosa Smith is still smaller, males measuring 6 mm and females 8 mm. The first pair of legs differ from those of Mysis in having the terminal portion, which is multiarticu-

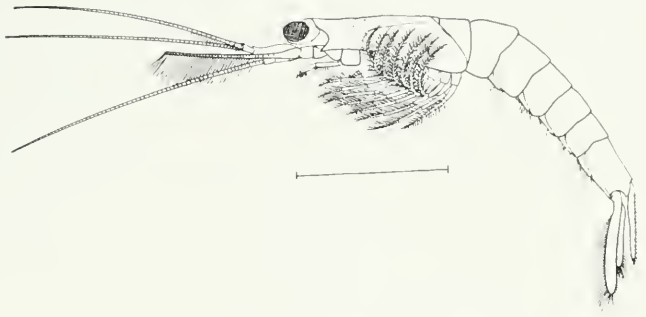

Fig. 2 Mysis stenolepis (Modified from Verrill)

late in that genus, composed of but three joints. The males are colorless and transparent and the females rose-colored.

Found in colonies, often in the dead shells of bivalve mollusks.

Order 3 DECAPODA

Malacostraca in which the head and thoracic segments are united to form a cephalothorax, which is usually covered by a carapace. The first three pairs of thoracic appendages are maxillipeds, while the following five pairs are, as the name Decapoda implies, the walking legs. In these the exopodite or outer branch of the typical crustacean limb has disappeared, leaving the leg uniramous. The first leg is usually larger than the others and by the growth of the penultimate segment, forms a claw or chela.

They breathe by gills which are hollow outgrowths from the bases of the thoracic legs or of the thoracic wall and which are covered by the carapace. The eyes are stalked.

The Decapoda is a large group and contains the largest and most striking of the Crustacea and has consequently been the most studied. The literature is therefore extensive; but besides the works already referred to under Crustacea any other important ones will be mentioned under the separate species.

The Decapoda are divided into two suborders: *a* Macrura, *b* Brachyura.

Suborder *a* MACRURA

Decapoda in which the cephalothorax is usually longer than broad and the abdomen is large and well developed and carried straight out behind. The second pair of antennae are long and many jointed and the last pair of maxillipeds are leglike. The walking legs are well developed and have the terminal joints of one or more of them modified into chelae. The abdominal appendages are generally all present, and the last pair, the uropoda, are broader and form, with the terminal segment, a tail fin.

The eggs are carried attached to the abdominal appendages of the female, and the young are hatched in a free-swimming form quite unlike the adult. This varies, however, greatly in different forms, and in the crayfishes the newly hatched young are very like the adult in everything except size.

This suborder includes the shrimps and prawns, which are found, sometimes in great numbers, among the seaweeds on piles or wharves. The lobster, which is now extinct in New York city, belongs in this group, as does the crayfish, common in the brooks.

Keys to the macrurous Crustacea of North America are to be found in the *American Naturalist,* 1899, v.33, as follows: "The Caridea," J. S. Kingsley, p.709; "Astacoid and Thalassinoid Crustacea," J. S. Kingsley, p.819; "The Astacidea," W. P. Hay, p.957.

The Macrura are divided into four tribes: 1 Caridea, 2 Astacidea, 3 Thalassinidea, 4 Anomura.

1 CARIDEA

Small or moderate sized forms with a rather compressed body. Carapace smooth and without sutures and produced into a longer or shorter rostrum, frequently toothed. The carapace is not fused in front with the epistome (the frontal region between the eyes). Antennae with a large scale. The thoracic legs are generally long and delicate, one or more of the anterior ones being chelate.

This group includes the shrimps and prawns, and our common species represent the three families Crangonidae, Palaemonidae and Penaeidae.

Family CRANGONIDAE

Crangon vulgaris Fab.

Shrimp

Crangon vulgaris Fabricius. Ent. Syst. Sup. 1798. p.410. Verrill. *l. c.* 1874. p.550, pl.3, fig.10.

Crangon septemspinosis DeKay. *l. c.* 1844. p.25, pl.8, fig.24.

Carapace flattened on dorsal surface and with a minute flattened rostrum. Antennulae biflagellate, outer flagellum about as long as antennal scale, inner slightly longer. Last pair of maxillipeds pediform. First pair of legs largest and subchelate, second pair smallest.

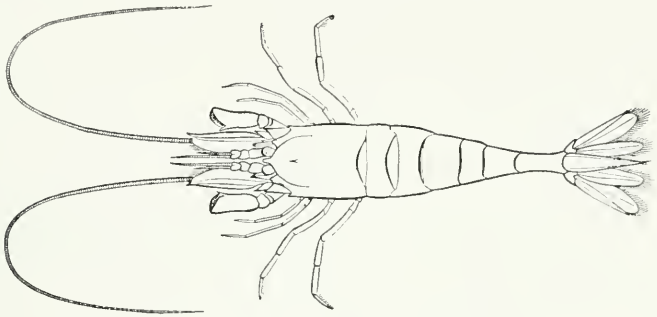

Fig. 3 Crangon vulgaris (After Verrill)

Length 50 mm. Color light, but thickly spotted with dark gray or black markings, which cause it to resemble closely the sand. In muddy localities, where the bottom is darker, the spots are more numerous and larger, so that the animals have an almost uniform color.

They are found on the bottoms of the bays in shallow water, either lying upon the sand or buried in it with only the eyes and antennae exposed. It is a very active form, springing quickly away when any attempt is made to capture it but it needs all its powers of concealment and action, for it is hunted by many fishes, and, according to Verrill, it constitutes the principal food of several species, among which are the weakfish, bluefish, flounders, striped bass etc.

It is a very widely distributed species, occurring all over the northern hemisphere. It is the edible shrimp of Europe.

Family PALAEMONIDAE

Palaemonetes vulgaris (Say)

Prawn

Palaemon vulgaris Say. *l. c.* 1818. p.248. DeKay. *l. c.* 1844. p.29, pl.9, fig.30.

Palaemonetes vulgaris Verrill. *l. c.* 1874. p.550. pl.2, fig.9.

Characterized by the presence of a straight, thin rostrum, as long as the carapace, and with eight or nine teeth above and four below. Antennulae triflagellate, longer branches two thirds the length of the antennae, which are slightly longer than the body. Second pair of feet larger than first and both chelate.

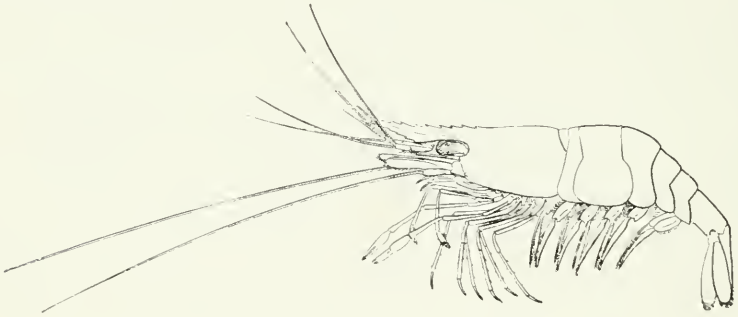

Fig. 4 Palaemonetes vulgaris (After Verrill)

Length 45 mm. Translucent and almost colorless, with irregular spots of brown and black.

Found in great numbers in the eelgrass or clinging to the Fucus on piles and wharves. It appears to like brackish water and runs up at times to where the water is entirely fresh. Important as a food for fishes.

Virbius zostericola Smith

Virbius zostericola Smith. In Verrill. *l. c.* 1874. p.550, pl.3, fig.11

Female, rostrum straight and as long as carapace, with two (rarely three) teeth on upper edge and three (sometimes two or four) on lower. Carapace smooth, armed with three spines on anterior part. Inner flagellum of antennae extending slightly beyond tip of antennal scale, outer flagellum much shorter. Abdomen geniculated at third segment, the posterior margin of which is prominent but not

acute. Males, smaller, more slender and with rostrum narrower vertically.

Length: female 20–26 mm, male 15–20 mm. Color translucent, usually bright green or pale with specks of brown or red and a broad median band of dark brown. Found among the eelgrass and taken in Jamaica bay.

Virbius pleuracanthus Stimp. may also be taken. It may be distinguished from the above by the shorter rostrum.

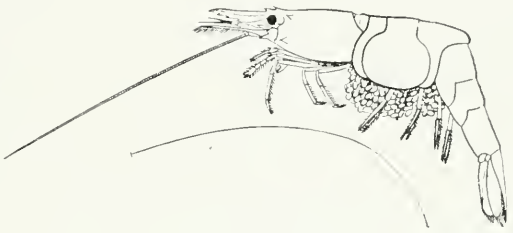

Fig. 5 Virbius zostericola (After Verrill)

Another much larger shrimp, measuring six inches in length, is occasionally taken in Great South bay and in the Hudson. This is the edible shrimp of the southern states, Penaeus brasiliensis Lat. and it belongs to the family Penaeidae.

2 ASTACIDEA

Moderate or large sized forms with a rather stout body. Antennal scale small or wanting. No longitudinal sutures, but a transverse suture separating the cephalic from the thoracic region, may be present. Carapace united in front with the epistome. First pair of thoracic legs in our forms are large and chelate and the two following pairs may also bear small chelae.

Our representatives of this tribe are the lobster and the crayfish, both of which belong to the family Astacidae.

Homarus americanus Mil.-Edw.

Homarus americanus Milne-Edwards. Hist. Nat. des Crus. 1837. 2:334. Herrick, F. H. U. S. Fish Com. Bul. for 1895. p.1, pl.A-J and 1-54.

This, the well known edible form, is no longer to be taken within the limits of New York city, the constant fishing to which it was subject, as well as the pollution of the water, having completely exterminated it.

A very complete description of its life history, habits etc. and a full literature list are to be found in the paper of Herrick's cited above.

Cambarus bartonii (Fab.)

Crayfish

Astacus bartonnii Fabricius. Ent. Syst. Sup. 1798. p.407. DeKay. *l. c.* 1844. p.22, pl.8, fig.25.

Cambarus bartonii Hagen, H. A. Mus. Comp. Zool. Mem. 1870. v.2, no.1, p.75.

Faxon, W. Mus. Comp. Zool. Mem. 1885. v.10, no.4.

Huxley, T. H. The Crayfish.

This is the well known crayfish and is the only species of the genus so far found in New York city, so that it is unnecessary to give any description of it. The genus is moreover a very perplexing one, and any one making a study of it should consult the works of Hagen and Faxon mentioned above.

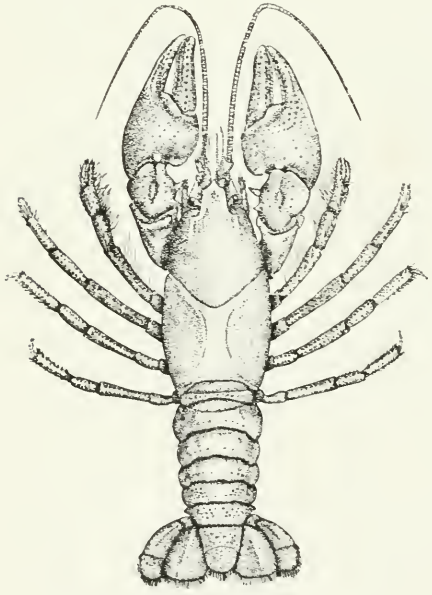

Fig. 6 Cambarus bartonii

Crayfishes are found under stones in the beds of small brooks or in springs, where they lie with their heads and antennae out, waiting for a small fish or a worm and ready to spring back at any sign of danger. In larger brooks with muddy banks they make burrows and are indeed a considerable nuisance in canals, as they undermine the sides, sometimes causing disastrous cave ins.

They either walk slowly along the bottoms on the tips of their legs, with the large chelae held straight out in front, or propel themselves backward through the water in a series of leaps, by the bending of the abdomen with its fanlike fin.

The eggs are large, and the young do not undergo any metamorphosis, being hatched in a form very similar to the adult.

3 THALASSINIDEA

Moderate sized forms with two longitudinal dorsal sutures and with a cervical suture frequently present. First thoracic legs usually large and chelate. Abdomen large. Burrowing forms.

Representatives of this group have not so far been taken within the city limits, but species of the genera Callianassa and Gebia may possibly be found. They inhabit deep burrows in the mud or muddy sand.

4 ANOMURA

Aberrant forms, at one time placed in a class by themselves but now united with the Macrura. Its principal diagnostic character is the reduction of the last pair of thoracic legs and their dorsal position. It includes the family Hippidae, the sand-bugs, and the Paguridae, the hermit crabs.

Family HIPPIDAE

Hippa talpoida Say

Sand-bug

Hippa talpoida Say, T. Acad. Nat. Sci. Phila. Jour. 1817. 1:160. DeKay. *l. c.* 1844. p.18, pl.7, fig.17. Verrill. *l. c.* 1874. p.548, pl.2, fig.5.

An oval and very convex form, with numerous longitudinal striations on the anterior portion of the cephalothorax. Eyes small and on long stalks. Second antennae as long as thorax and fringed with long hairs. First four thoracic legs large, not chelate, and adapted for burrowing. Terminal segment of abdomen long and triangular and folded close under the body.

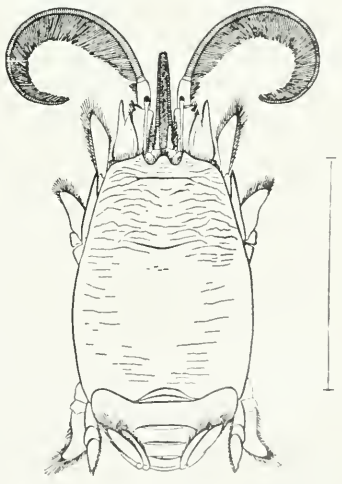

Fig. 7 Hippa talpoida (After Verrill)

The smooth surface and peculiar form of this species render it the most rapid burrower on our shores. It lives in the sand near low water mark, and, if dug out, will rapidly disappear again, going down into the sand backward.

Length 25 mm. Color yellowish white tinged with purple.

Occurs on the exposed southern shore of Long Island.

Family PAGURIDAE

a **Eupagurus pollicaris** (Say)

b **Eupagurus longicarpus** (Say)

Hermit crabs

a Pagurus pollicaris Say, T. Acad. Nat. Sci. Phila. Jour. 1817. 1:162. DeKay. *l. c.* 1844. p.19, pl.8, fig.21.

Eupagurus pollicaris Verrill. *l. c.* 1874. p.548.

Pagurus longicarpus Say, T. *l. c.* 1:163. DeKay. *l. c.* 1844. p.20, pl.8, fig.22.

Eupagurus longicarpus Verrill. *l. c.* 1874. p.549. Kingsley, J. S. Am. Nat. 1888. 22:888.

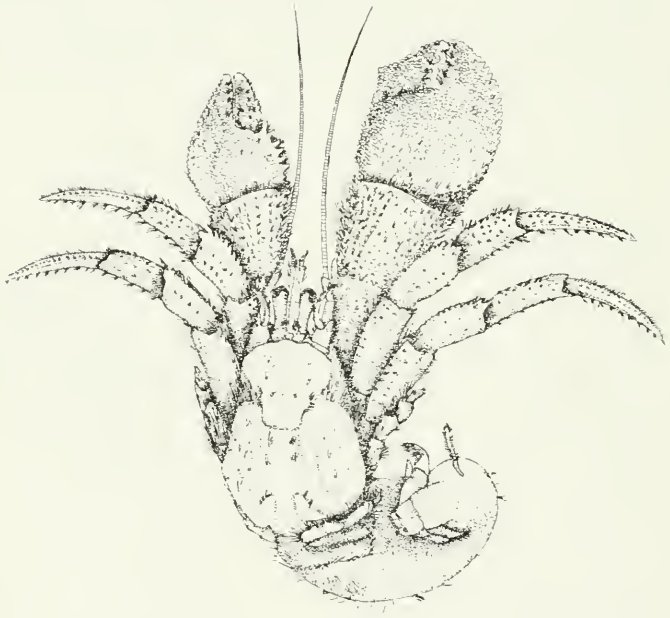

Fig. 8 Eupagurus pollicaris

Asymmetric forms with abdomen large but its integument not calcified. Abdominal appendages much reduced. Inhabit empty gasteropod shells.

In order to protect their soft abdomen, these forms ensconce themselves in empty gasteropod shells, and from this circumstance are known as hermit crabs, having a fancied resemblance to a hermit in his cell.

The first pair of thoracic legs are large and chelate, the right being generally larger than the left. The next two pairs are also large and end in simple points, and the last two pairs are much reduced. The abdominal appendages are more or less atrophied, except the last, which are modified into hooks for holding on to the columella of the shell. In the male these are the only pair present, but in the female the others are slightly developed, and to them the eggs are attached as in the other Macrura.

As the animal increases in size, it takes a larger shell, sometimes killing and eating the original inhabitant and sometimes taking a dead shell which suits it. Considerable has been written on the habits of these forms, and interesting accounts may be found in the works of Verrill and Kingsley cited above. These forms are easily kept in an aquarium.

Of the two species E. longicarpus is much the commoner and may be found on the sandy bottoms of the bays everywhere. It is the smaller form and usually occupies the shells of Ilyanassa or Anachis, though any small shell may be used. It may be distinguished by its size and by its elongated and smooth chelae.

In E. pollicaris, on the other hand, the chelae are shorter, stouter and covered with tubercles, and together they form an operculum to close the opening of the shell. This species occupies the shells of Natica and Sycotypus, and is found occasionally under rocks at low water, but usually occurs in deeper water on rocky or shelly bottoms.

E. longicarpus is frequently found covered with a variety of Hydroid, Hydractinia polyclina Agas. a case of commensalism.

Suborder *b* BRACHYURA

Decapoda in which the body is proportionally very broad, frequently broader than long, and in which the abdomen is much reduced and permanently flexed in a groove on the underside of the cephalothorax. The antennae are short, and the third maxillipeds are flattened and platelike, forming a covering for the other mouth parts. The first pair of legs are larger than the others and are modified into chelae. The other four pairs terminate in points

or the last pair may be flattened to form a finlike organ. The abdominal appendages are much reduced, two pairs being found in the male and one in the female.

The eggs, which are usually much smaller in proportion than in the Macrura, are carried attached to the hairs of the abdominal appendages of the female. The young are hatched in a form very different from the adult and known as a zoea. It is a free-swimming form, characterized by the presence of but two pairs of legs, which represent the second and third pairs of maxillipeds of the adult. The other appendages appear gradually at the successive molts of the animal, though up to a certain stage it still retains the zoea form. At that molt, however, it suddenly changes, attaining a form very similar to that of the adult, but with the abdomen held straight out behind instead of flexed. This is known as a megalops and by a further series of molts it attains the definitive crab form.

This order includes the crabs, among which the blue, or edible crab is familiar to everyone. Besides this, the large lady crab, the green crab and the spider crabs are found, walking over the bottoms of the bays or concealed under the seaweeds. Small mud crabs are found under stones in muddy situations, and the odd looking fiddler crabs occur on the marshes.

Keys to the Brachyura of North America by Mary J. Rathbun are to be found in the *American Naturalist*, 1900, v.34, as follow: "Cyclometopous or Cancroid Crabs," p.131; "Oxyrhynchous and Oxystomatous Crabs," p.503; "Catometopous or Grapsoid Crabs," p.583.

The Brachyura are divided into four tribes: 1 Cyclometopa, 2 Oxyrhynca, 3 Catometopa, 4 Oxystomata.

These may be separated by the form of the carapace and the front, that is the portion between the eyes. The Oxystomata are not represented.

1 CYCLOMETOPA

Cancroid crabs. Carapace usually broader than long and regularly arched in front. No rostrum.

Divided into three families, Cancridae, Pilumnidae and Portunidae, all of which are represented.

Family CANCRIDAE

Cancer irroratus Say

Rock crab

Cancer irroratus Say, T. (male only, the female being C. borealis) Acad Nat. Sci. Phila. Jour. 1817. p.59, pl.4, fig.2. Verrill. *l. c.* 1874. p.546. Smith. *l. c.* 1878. p.38.

Platycarcinus irroratus De Kay. *l. c.* 1844. p.6, pl.2, fig. 2.

Carapace rounded, with nine blunt teeth on each side of the anterior part. Last pair of legs end in points.

It is a northern form, being the common crab of the New England states, but extends down into New Jersey. It is found

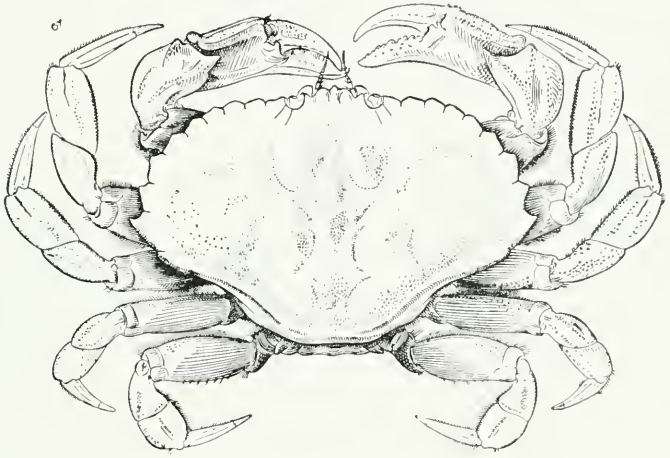

Fig. 9 Cancer irroratus (After Rathbun)

under large rocks near low water or buried in the sand or gravel beneath them, but may also occur on the sandy beaches.

Length of carapace 75 mm, breadth 100 mm. Color light, but thickly spotted over with many small red dots which give the prevailing color.

The allied species, C. borealis Stimpson, the northern crab, may possibly be found within the city limits. This is a rather larger and heavier species than irroratus and frequents rocky localities, usually being found on the rocks, and not underneath. Farther north it is found cast on the beaches in considerable numbers. It possesses the nine lateral teeth, but those on the side are more pointed, and the carapace is rougher than in irroratus.

Family PILUMNIDAE

Panopeus harrisii (Gould)

Panopeus depressus Smith

Panopeus sayi Smith

Mud crabs

Pilumnus harrisii Gould, A. A. Invert. of Mass. 1841. p.326. DeKay, J. E. *l. c.* 1844. p.7, pl.7, fig.15.

Panopeus depressus and P. sayi Smith, S. I. Soc. Nat. Hist. Bost. Proc. 1869. 12:283 and 284.

Benedict, J. E. & Rathbun, M. J. The Genus Panopeus. U. S. Nat. Mus. Proc. 1891. 14:355.

Small forms with dull colors, carapace broader than long and with several short teeth. Last pair of legs somewhat flattened but ending in points.

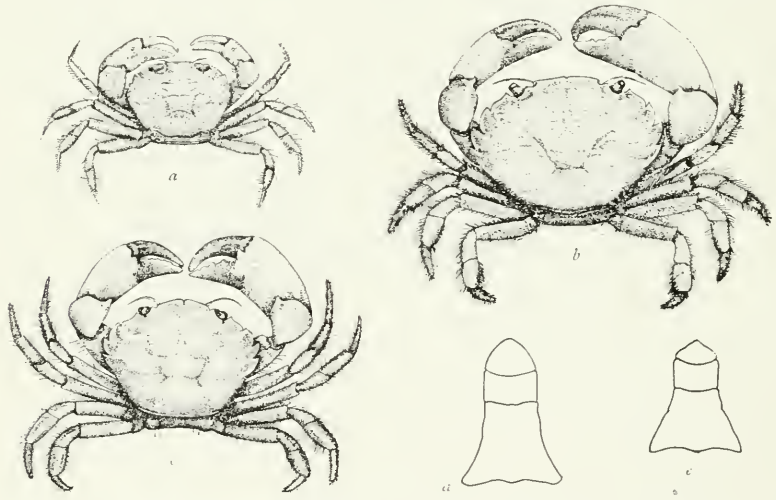

Fig. 10 *a*=Panopeus harrisii; *b*=P. depressus; *c*=P. sayi; *d*=abdomen of male of P. depressus; *e*=of P. sayi

Panopeus is a large genus with many species closely resembling each other, and three of them are found within the city limits. They are all small and have similar habits, being, as their name indicates, mud-inhabiting forms. In muddy localities they are found in considerable numbers, under stones below high water mark, and extend from there out into deeper water. They are very common on the oyster beds, and many are brought up by the tongers

and dredgers. In these localities they appear to be fond of living within the dead shells of oysters which are slightly gaping and filled with mud, but they will take up their abode in almost any crevice they can find. The red sponge, Microciona prolifera, is frequently filled with small specimens. They are not at all active in their movements, and probably remain for long periods in their retreats, waiting for their food to come to them. When disturbed however, they try to conceal themselves under the nearest rock or in the mud.

P. depressus and sayi are very similar and are frequently found together and may be distinguished from harrisii by their larger size and heavier build, and in having the fingers or ends of the larger claws black.

The two species differ in the form of the carapace, an adult specimen of P. sayi measuring about 17 mm in length by 22.5 mm in breadth, a ratio of 1 to 1.34. P. depressus is broader in proportion to its length, a New York specimen measuring 26.5 mm by 18 mm, a ratio of 1 to 1.47. The carapace of sayi is also more swollen and convex than that of depressus, and the front is arcuate in the former and nearly straight in the latter. The terminal segment of the abdomen of the male is in sayi [fig.10e] broadly triangular and wider than long, while in depressus [fig.10d] it is more nearly an equilateral triangle.

P. harrisii is found near high water mark and is rarer than the others. Adults measure 14 by 11 mm, and the carapace has more of a quadrilateral form. The large claws are also more slender and are of a lighter color, and the walking legs are slender and compressed. The transverse lines on the carapace are more prominent than in the others.

Sayi and depressus are very common along the shores wherever there are mud and stones, and may always be found there. Harrisii has been taken under stones near Flushing and at the Fresh Kills on Staten Island.

Family PORTUNIDAE

Callinectes hastatus Ordway

Edible crab, blue crab

Callinectes hastatus Ordway. Bost. Jour. Nat. Hist. 1863. 7:568. Verrill. *l. c.* 1874. p.548.

Lupa diacantha DeKay. *l. c.* p.10, pl.3, fig.3.

Callinectes sapidus Rathbun, M. J. U. S. Nat. Mus. Proc. 1896. 18:349, pl.12-14.

Carapace twice as long as broad, with a sharp spine at each side. Last pair of legs with the terminal segment flattened. Color dark green.

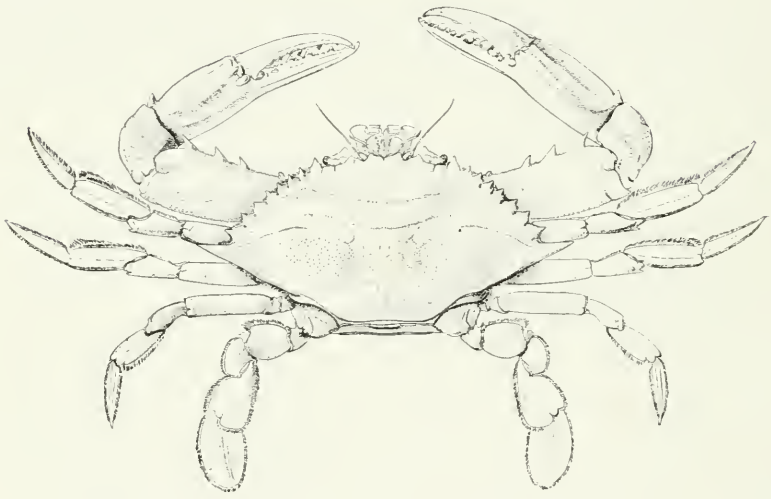

Fig. 11 Callinectes hastatus (After Rathbun)

This is the common form sold in the markets and is doubtless the most familiar of the Brachyura to those who are not naturalists. It occurs on the bottoms of the bays or clinging to the seaweeds on the wharves and extends some distance up into fresh water, specimens having been taken at Newburgh. As may be supposed from the finlike posterior legs, it is a good swimmer and may often be found at the surface.

The young do not have the characteristic color of the adult, but are much lighter, with numerous small black spots, and closely resemble the sand and pebbles on which they live. They are just as pugnacious as the adult and, when cornered, dance around, hold-

ing out their claws in a menacing manner, but finally running off sideways and concealing themselves under stones or seaweeds. Interesting accounts of the adults are found in the paper by Rathbun.

The "soft shell crab" of commerce is this species taken after it has shed its hard shell and before the new one has hardened. The operations of catching the crabs about to shed, and keeping and watching them till they do so, form a very important business, whose headquarters are at Crisfield Md. Some of it is done on the shores of Great South bay, L. I. and a short account of the industry has been given by the writer.[1]

Crabbing is one of the amusements of the summer population of the shore, the process being to entice the crab within reach by means of a fish head or other bait and then capture him with a net. As the crabs can give a fairly good nip with their strong claws, it is quite liable to afford considerable amusement.

The females with eggs are rarely found in this latitude, as they seem to prefer deeper water, but they are occasionally taken on pound nets. The eggs are small and very numerous.

Length 13 cm across the carapace. Color dark green, white below; feet blue; spines and fingers tipped with red.

Common on southern shore of Long Island and occasionally found on northern.

Platyonichus ocellatus Latreille

Lady crab

Platyonichus ocellatus Latreille. Ency. Meth. 16:152. DeKay. *l. c.* 1844. p.9, pl.1, fig.1; pl.5, fig.7. Verrill. *l. c.* 1874. p.547, pl.1, fig.4.

Carapace almost circular, with five acute teeth on each side; last pair of legs flattened and rounded. Color light with red spots.

This is a very handsome species, and according to De Kay the name lady crab is given it on account of the beauty of its coloring. As in the blue crab, the last pair of legs are flattened, so that it is a good swimmer. Its usual habitat is the sandy beaches, even the most exposed, where at low water mark, it buries itself, all but the eyes and antennae and is on the watch for enemies and prey. If

[1] N. Y. State Mus. 55th An. Rep't. 1901. p. 1129-38.

disturbed when feeding or if dug out, it disappears with great rapidity, burrowing backward into the sand. It is predacious, feeding upon other forms, but, like most crabs, will eat dead fish or other animals.

Its cast skin, which is very brilliant with its red spots, is frequently found on the beach.

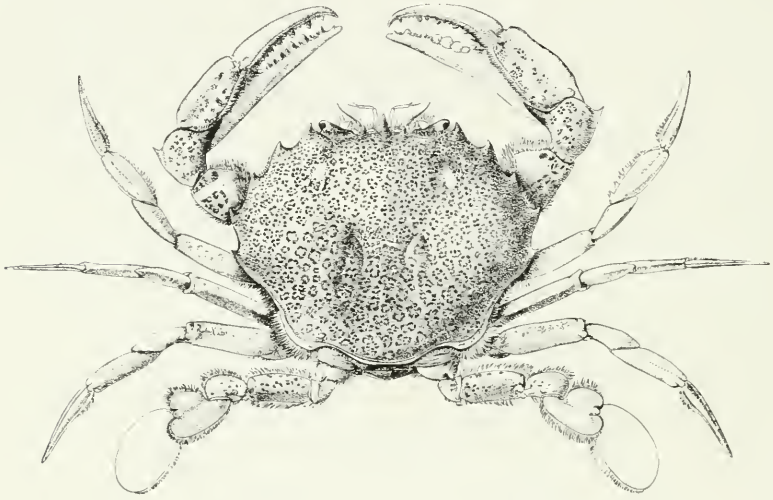

Fig. 12 Platyonichus ocellatus (After Rathbun)

This species was described in 1799 by Herbst and its locality given as "Long-Eiland bey Newyorck".

Length of carapace 6 cm. Color light, but with numerous bright red or purple spots, which are arranged in circles on the carapace and are largest on the claws.

Sandy beaches.

Carcinus moenus Leach

Green crab

Carcinus moenus Leach. Mal. Podoph. t.v.f.1-4. DeKay. *l. c.* 1844. p.8, pl.5, fig.5, 6.

Carcinus granulatus Verrill. *l. c.* 1874. p.547.

Carapace slightly broader than long, with five acute teeth; posterior legs end in points; color green.

A rather striking looking species, which is found running over the bottoms in shallow water or concealed under rocks or seaweed between tides. It is a very active and pugnacious creature, and the

crab fishermen say that a single green crab will kill all the edible crabs in a shedding car. It has been accused in England of killing and eating the young oysters while their shells were thin. In France, from its excitable nature, it is known as the *crabbe enragé*. It is a favorite article of food all along the European coast.

Fig. 13 Carcinus moenus (After Rathbun)

Breadth of carapace 5 cm. Color green, variously mottled with shades of yellow.

Occurs all along the coast in suitable localities.

2 OXYRHYNCA

Carapace usually narrow in front, sometimes rounded but always with a rostrum.

Divided into two families, Maiidae and Parthenopidae, of which the first is represented by two species. Members of the other family may possibly occur, but have not been taken.

Family MAIIDAE

Libinia emarginata Leach

Libinia dubia Milne-Edwards

The spider crabs

Libinia emarginata Leach. Zool. Misc. 1815. 2:129. Rathbun. U. S. Nat. Mus. Proc. 1892. 15:235.

Libinia canaliculata DeKay. *l. c.* 1844. p.2, pl.4. Verrill. *l. c.* 1874. p.548.

Libinia dubia Milne-Edwards. Hist. Nat. des Crus. 1834. 1:300, pl.14 bis, fig.2. Verrill. *l. c.* 1874. p.548. Rathbun. *l. c.* 1892. p.237.

Carapace evenly rounded behind the frontal region; rostrum short and bifid at the tip; body with spines; legs of moderate length.

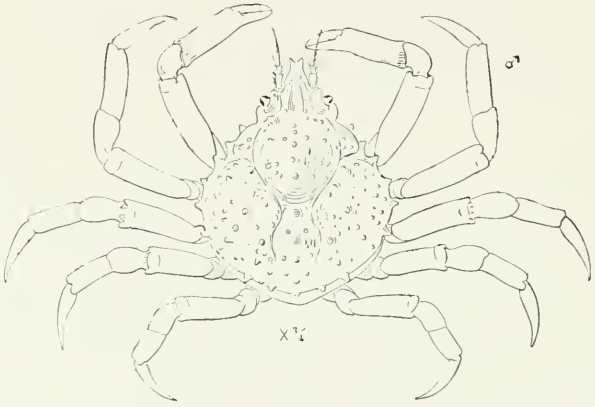

Fig. 14 Libinia emarginata (After Rathbun)

L. emarginata may be distinguished from L. dubia by the greater number of spines on the carapace and by the median row, consisting in the former of nine, and in the latter of six spines.

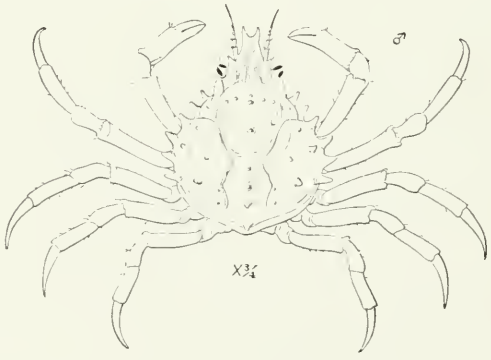

Fig. 15 Libinia dubia (After Rathbun)

Both species occur, the former the more commonly, walking over the bottoms of the shallow bays among the eelgrass, and they extend out into deeper water. They are frequently dredged on the oyster beds, and sometimes appear in such numbers that operations have to be suspended till the spiders, as the fishermen call them, have passed over.

They are slow moving animals, and their carapaces are not infrequently so covered with foreign matter, such as worm tubes, living hydroids and algae, that it is difficult to distinguish them from their surroundings. One crab taken had the entire body covered with a soft velvety-looking mass of the hydroid Hydractinia, which occurs on the hermit crabs. Members of this family have been observed sticking bits of algae, hydroids etc. on bare spots of the carapace with their pincers.

Length 4–6 cm.

Occurs along the shore in the bays.

The tribe Oxystomata is not represented in New York.

3 CATOMETOPA

Carapace broad anteriorly, often subquadrate, sometimes subglobose; truncate or arcuate anteriorly but always without a rostrum. Front bent downwards. Epistome short.

Of the four families, Ocypodidae, Grapsidae, Gecarcinidae and Pinnotheridae, representatives of the first and fourth have been taken.

Family OCYPODIDAE

Gelasimus pugilator Latreille

Gelasimus minax Le Conte

Gelasimus pugnax Smith

Fiddler or soldier crabs

Gelasimus pugilator Latreille. Nouv. dict. d'hist. nat. ed.2, 1817. 2:520. Smith, S. I. Ct. Acad. Arts and Sci. Trans. 1870. 2:113, pl.4, fig.7. Verrill. *l. c.* 1874. p.545.

Gelasimus vocans DeKay. *l. c.* 1844. p.14, pl.6, fig.9 (pars).

Gelasimus minax LeConte. Acad. Nat. Sci. Phila. Proc. 1855. 7:403. Smith. *l. c.* p.128, pl.2, fig.4, pl.4, fig.1-1b. Verrill. *l. c.* 1874. p.545.

Gelasimus pugnax Smith. *l. c.* 1870. 2:131, pl.2, fig.1, pl.4, fig.2-2d. Verrill. *l. c.* 1874. p.545.

Gelasimus vocans var. a. DeKay. *l. c.* 1844. p.14, pl.6, fig.10.

Carapace rather quadrangular; one of the first pair of walking legs of the male enormously developed and carried horizontally, both of first pair of female small.

Of the three species G. minax is much the largest, and has red spots at the articulations of the joints. G. pugnax and pugilator are distinguished by the presence in pugnax (as

in minax) of an oblique ridge across the palm of the large claw, while the palm of pugilator is smooth.

These three species are commonly known as "fiddlers": for, when running over the beach with the large claw held out in front of them and the small one sawing in front of it, they ludicrously resemble a man carrying a bass viol. The old specific name vocans was given them because, when the tide was out, they

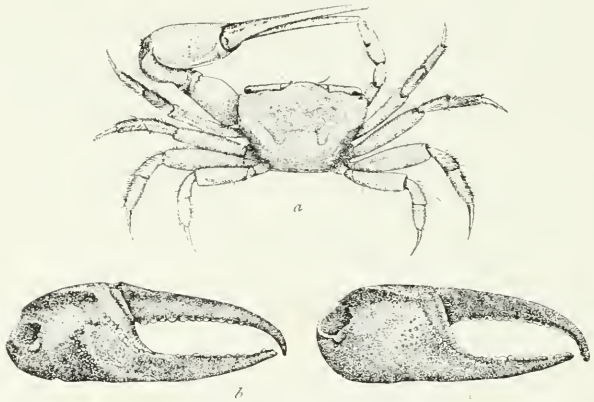

Fig. 16 *a* = Gelasimus minax; *b* = claw of G. pugnax; *c* = claw of G. pugilator

appeared to stand on the beach and wave their great claws, calling it back again.

The species are mostly vegetarians, feeding on algae, which they pick off with their small claws. They live in burrows in the sand and mud, where they are abundant, completely honeycombing it. Their habits and mode of life have been interestingly described by Verrill *l. c.* p.336, and Kingsley, Am. Nat. 1888, 22:888. They are easily kept in captivity, on damp sand, and may be fed on crackers dipped in water.

G. minax and pugnax are found on the salt marshes, while G. pugilator occurs on sandy or muddy beaches near high water mark and is rarer than the other two. They may be found almost anywhere along the shore, sometimes, as was the case at Rockaway Beach, in such numbers that the entire shore appeared to be in motion.

Family PINNOTHERIDAE

Pinnotheres ostreum Say

Oyster crab

Pinnotheres ostreum Say, T. Acad. Nat. Sci. Phila. Jour. 1817. 1:67, pl.4, fig.5. DeKay. *l. c.* 1843. p.12, pl.7, fig.16. Verrill. *l. c.* 1874. p.546 (figure given is P. maculatum).

Carapace rounded, that of female soft and thin, eyes small. Female found only in branchial cavity of oyster.

The members of this genus are noteworthy in that the females live within the branchial cavity of certain lamellibranch mollusks, the present species inhabiting the oyster, while an allied form, P. maculatum, lives in the common mussel. The males are free.

These crabs were originally known as Pinnoteres, "the guardian of the Pinna," for an allied species in Europe lives in the shell of a lamellibranch, Pinna, and was supposed to give warning to the mollusk at the approach of any danger, so that it could close its shell.

The oyster crab is of some economic importance as food, but the difficulty of obtaining a sufficient supply limits its use.

Order 4 STOMATOPODA

Malacostraca with a small carapace which does not cover the last three thoracic segments. The abdomen is proportionally very large, and its first five appendages bear gill filaments. The first five thoracic appendages are maxillipeds, and the last three are small biramous legs. Eyes stalked.

A very small order with only one representative on our coast.

Squilla empusa Say

Mantis shrimp

Squilla empusa Say, T. *l. c.* 1818. 1:250. DeKay. *l. c.* 1844. p.32, pl.13, fig.54. Verrill. *l. c.* 1874. p.551.

A large form, which, besides the characters of the order, shows the following: Antennulae with three flagella, antennae shorter, with a large scale. The second maxillipeds large and subchelate, the

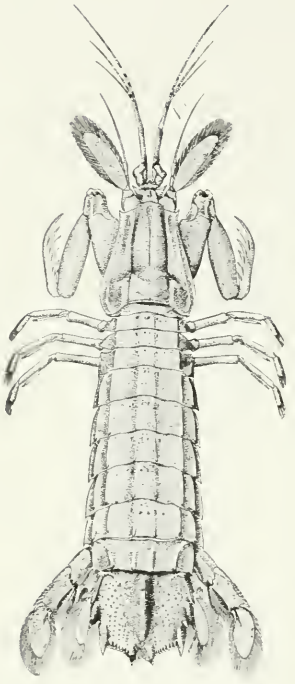

Fig. 17 Squilla empusa (After Rathbun)

serrated dactylus folding back on the propodus like a knife blade. The tail fin is large and armed with spines, which can give a severe dig if the animal is handled incautiously.

It inhabits burrows of its own construction, 15–20 mm in diameter, in the soft mud in shallow water.

Length 15–25cm. Color yellowish with green, brown and yellow markings.

Taken at Cold Spring Harbor and may be found within the city limits.

Order 5 CUMACEA

A small order of Malacostraca, in which the anterior part of the body is very much larger than the posterior. A carapace is present, covering the anterior segments and leaving never more than five segments exposed. Abdomen cylindric, flexible, of six segments, the fifth longest.

The members of this order are bottom forms, extending to very great depths and reaching their greatest development in colder

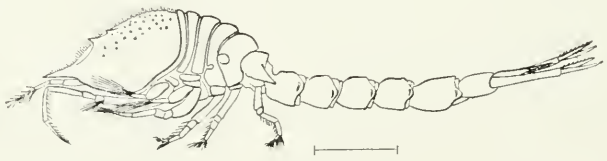

Fig. 18 Diastylus quadrispinosa Sars (After Verrill)

waters. None have been taken so far in New York city, but several species will probably be obtained by dredging.

The species of Diastylus figured is common, according to Verrill, on soft muddy bottoms in Vineyard sound.

Order 6 ARTHROSTRACA

Malacostraca in which the first, and in some cases the second thoracic segment also, is fused with the head. The remaining segments are free, and there is no carapace. Eyes generally sessile or without stalks.

A large group, none of which attain very great dimensions. The head and the first thoracic segment are indistinguishably fused to form an incomplete cephalothorax, and the first thoracic appendage is a maxilliped. The next seven thoracic segments are free and bear legs, and the abdominal segments may or may not be fused.

The large eggs are carried by the female in a brood pouch formed by flat platelike appendages of certain thoracic legs. There is no metamorphosis, the young being hatched in a form resembling the parent.

Divided into two suborders: *a* Amphipoda, *b* Isopoda.

Suborder *a* AMPHIPODA

Arthrostraca in which the body is usually compressed from side to side. The gills are borne on the thoracic appendages.

The larger suborder of the two. In addition to the above characters, it may be distinguished by the large abdomen, which, except in the Caprellidae, where it is vestigial, is as long as the thorax and has the segments free.

Both pairs of antenna are present and either or both may be well developed. Eyes sessile in all of our forms. The first two pairs of thoracic legs, which are known as gnathopods, are frequently large, specially in the males, and subchelate, the terminal joint being bent back against the penultimate. The last three pairs are generally long and adapted for leaping. The abdominal appendages are biramous and the first three pairs are long and delicate and function as swimming organs. The last three are stouter and assist in leaping and are known as uropods.

To this suborder belong the "beach fleas," which are seen actively skipping around on the sand or hiding, sometimes in great numbers, under debris on the shore. Others are found under stones near tide marks, or burrowing in the sand or living in tubes of their own construction. Still others live in seaweeds or among eelgrass.

They are of considerable economic importance, as they frequently occur in immense numbers and are an important, if not the principal, food of many fishes.

Bate, G. Spence. Catalogue of the Amphipodous Crustacea of the British Museum. Lond. 1862.

Bate & Westwood. British Sessile-eyed Crustacea. Lond. 1863.

Holmes, S. J. Synopses of North American Invertebrates, 18. The Amphipoda. Am. Nat. 1903. 37:267.

Sars's work, mentioned before, is also valuable, as it gives a classification of the group and many figures of species, some of which are found on our shores.

The Amphipoda are divided among three tribes: 1 Hyperiidea, 2 Gammaridea, 3 Caprellidea.

The first of these is purely pelagic or free-swimming and its forms generally possess relatively enormous eyes. Specimens have not been taken within the city limits but they probably occur. By far the greater number of species belong to the second tribe, the third, which is of a distinctly degraded type, being a small one.

2 GAMMARIDEA

According to Sars, this tribe is divided into 25 families and of these 7 have common representatives in New York city.

Family ORCHESTIDAE

Antennulae much shorter than antennae and devoid of a secondary flagellum. Mandibles without a palp. Gnathopods variable, the second pair being generally different in the two sexes. First two pairs of uropoda strong, last pair smaller and one branched.

A very distinct family, the members of which have become more or less adapted to terrestrial life. They may be said to be *the* beach fleas.

Allorchestes dentata (Smith)

Hyalella dentata Smith, S. I. U. S. Fish Com. Rep't. 1872-73. p.645, pl.2, fig.8-10.

A fresh-water form in which the first and second abdominal segments are produced dorsally into spines.

Much the smaller of the two fresh-water Amphipods found within the city. It also differs from Gammarus fasciatus, the

other form, in the lack of a secondary flagellum to the antennulae and in the gnathopoda. The first pair of these are small and sub-

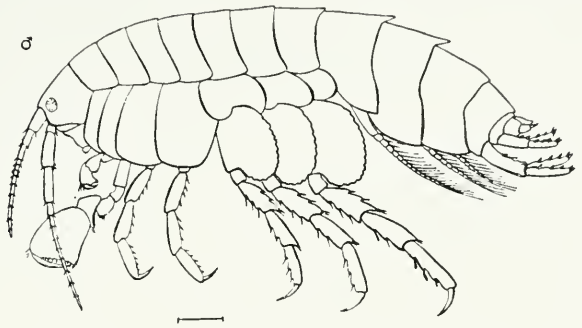

Fig. 19 Allorchestes dentata (After Smith)

chelate in both sexes, and the second are small in the female and large in the male.

Length 4.5–6.5 mm.

Occurs in the fresh-water ponds and stagnant pools throughout the city.

Allorchestes littoralis Stimpson

Allorchestes littoralis Stimpson, W. The Marine Invertebrata of Grand Manan. Smithsonian Contributions to Knowledge, 6. Wash. 1854.
Hyale littoralis Verrill. *l. c.* 1874. p.556.

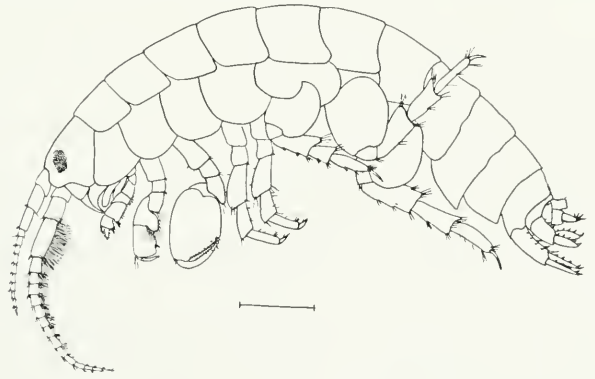

Fig. 20 Allorchestes littoralis

Antennae less than one third length of body, much stouter than antennulae and with thick fascicles of hairs. First gnathopoda small, subchelate and alike in both sexes. Second gnathopoda of similar form in both sexes but much larger in the male.

A littoral species, living under stones below high water mark.

Length 8–10 mm. Color green of varying shades to brown. A few specimens were taken on the Chimney Sweeps near City Island.

Orchestia agilis Smith

Orchestia agilis Smith, S. I. In Verrill. *l. c.* 1874. p.555, pl.4, fig.14.

First gnathopods subchelate in both sexes: second pair of male much larger than first, with the hand oval and a notch at the posterior end of the palm. Antennulae not reaching penultimate joint of antennae. Flagellum of antennae stout, shorter than the peduncle

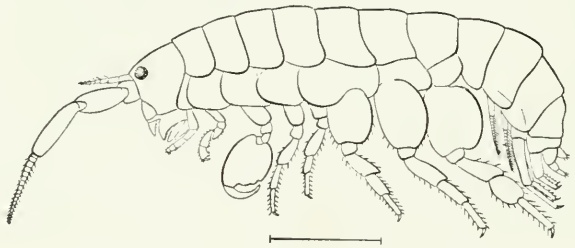

Fig. 21 Orchestia agilis (After Verrill)

and with 12–15 segments. First coxal plate small, fifth nearly as deep as fourth and deeply cleft. Carpus of third pereiopod of male swollen.

As its name implies, this is a very active form and it occurs in great numbers under the debris, seaweed, eelgrass etc. cast up by the tide, about high water mark. When this is turned over, they make off by leaps in every direction, so that it is difficult to catch them, and then hide under the edges of stones or other objects.

Length: male 10–15 mm, female 10–14 mm. Color varies greatly, and all shades are found, from a light flesh color through pink or olive green to a deep slate or almost to black.

This species is distributed almost everywhere along the shore of the bays and may nearly always be found.

Orchestia palustris Smith

Orchestia palustris Smith, S. I. In Verrill. *l. c.* 1874. p.555.

Gnathopods as in O. agilis, but with palm of second pair of male smooth and without the notch. Antennulae reaching beyond

tip of penultimate joint of antennae. Flagellum of antennae slender, longer than the peduncle and with 18 to 26 segments. Coxal plates as in preceding species.

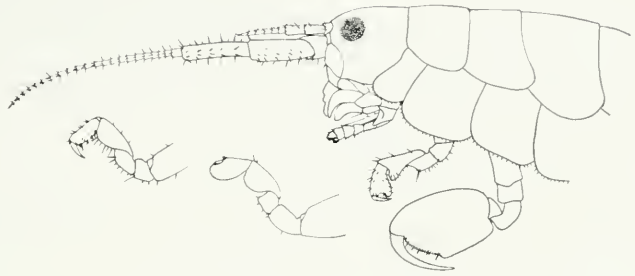

Fig. 22 Orchestia palustris male, and first and second gnathopoda of female

Very common under stones and logs above high water mark and somewhat farther from the water than agilis.

Length: male 15–22 mm, female 12–18 mm. Color varies much as in O. agilis.

Found all along the shores of the bays.

Talorchestia longicornis (Say)

Talitrus longicornis Say, T. *l. c.* 1818. p.384.
Talorchestia longicornis Verrill. *l. c.* 1874. p.556. Smallwood, M. E. Cold Spring Harbor Monographs, 1. Brooklyn. 1903.

First gnathopods subchelate in the males but not in the females. Second gnathopods of male very large, subchelate, broader distally and with a large tubercle on the palm. Antennulae just reaching tip of penultimate joint of antennae, which are as long as the body. Eyes of moderate size. Coxal plates and uropods much as in Orchestia.

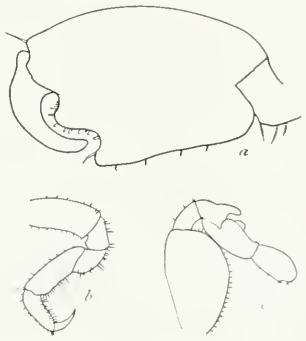

Fig. 23 Talorchestia longicornis; *a* = second gnathopod of male; *b* = first and *c* = second gnathopod of female

Found on the sand beaches between and above tide marks, often running or leaping over the sand but usually buried in it or under driftwood. An exceedingly good account of its habits is given by Smallwood [*l. c.*] to which the

reader is referred. Smallwood is inclined to regard this and the succeeding species as identical, but representing different stages in the life of the animal, those called longicornis being the older individuals.

Length 15–25 mm. Color cream or sand-colored, the older specimens showing markings of ocher, brown or violet.

Common on sand beaches.

Talorchestia megalophthalma (White)

Orchestia megalophthalmia White. Cat. Crus. Brit. Mus.
Talorchestia megalophthalma Verrill. *l. c.* 1874. p.556.

Gnathopods as in T. longicornis, but palm of male without the tubercle. Antennulae reaching tip of penultimate joint of

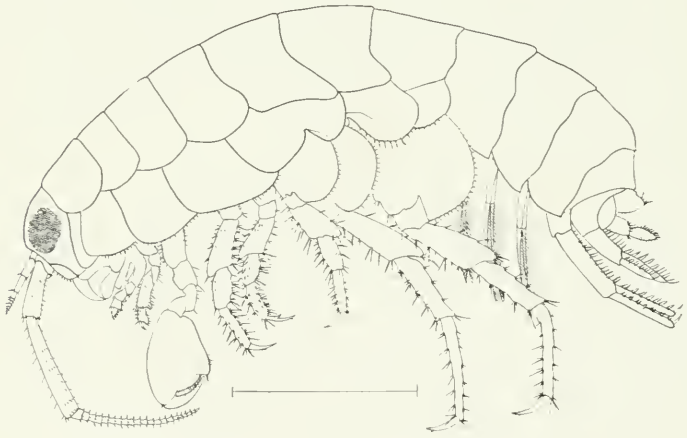

Fig. 24 Talorchestia megalophthalmia

antennae, which are less than half the length of the body. Eyes very large, occupying greater part of the head.

Habits and color as in the preceding species.

Length 15–25 mm.

Found on sandy beaches.

Family PONTOPOREIIDAE

Antennulae somewhat shorter than antennae and with a secondary flagellum. Mandibles with a palp. Gnathopoda comparatively small and feeble, generally imperfectly subcheliform. Pos-

terior pereiopoda more or less dissimilar in structure and adapted for burrowing in soft bottoms. Uropoda all biramous, the last pair generally unlike the others.

A family which possesses great abilities in burrowing; and the pereiopoda are correspondingly greatly modified. The one species taken probably has the most extreme development in that direction.

Haustorius arenarius (Slab.)

Oniscus arenarius Slabber. Naturkunde Verlustigingen etc. p.92, pl.2, fig.3 and 4.

Lepidactylus dytiscus Say, T. *l. c.* 1818. p.380. Verrill. *l. c.* 1874, p.556. Smith, S. I. Ct. Acad. Arts and Sci. Trans. 1880. 4:282.

Haustorius arenarius Sars. *l. c.* 1895. p.135, pl.46.

Antennae with long and plumose hairs. Posterior pereiopoda very broad and without dactylus.

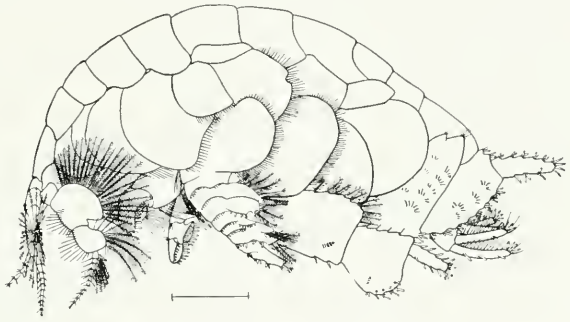

Fig. 25 Haustorius arenarius

This species can not be confounded with any other found on our coast. Its peculiar form, in which it somewhat resembles the sand bug, Hippa, and the character of its appendages, cause it to be the most rapid burrower of our coast.

Length 10–12 mm. Cream or sand colored.

Taken at Bayshore and Freeport and will probably be found in the sand along the bays, near high water mark.

Family AMPELISCIDAE

Body compressed anteriorly. Eyes generally four. Antennulae slender, without accessory flagellum, and placed at anterior end of head. Antennae somewhat larger and placed farther back. Last two segments of abdomen fused. Third pereiopoda different from

the preceding, with basal joint large and produced behind into a ciliated lobe.

A burrowing family, only a single species of which has been taken, though others probably occur.

Ampelisca macrocephala Lillg.

Ampelisca macrocephala Lillgeborg. Öfvers. af Kongl. Vet. Akad. Förh. 1852. p.7. Sars. *l. c.* 1895. p.172, pl.60, fig.1.

Head as long as the first three thoracic segments. Eyes four, small, red and at anterior end of head. Lower posterior angle of the third abdominal segment produced. Basal segment of third pereiopoda nearly transverse below, the carpus not produced anteriorly.

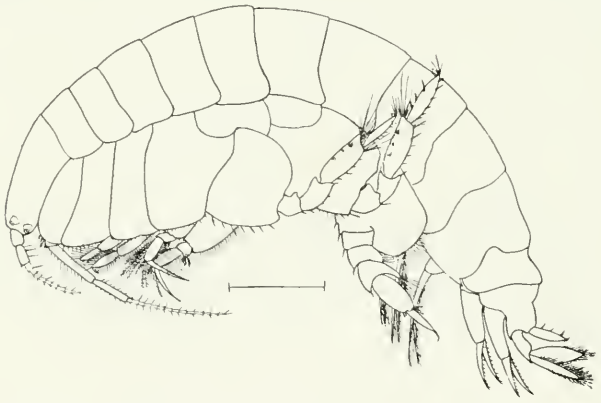

Fig. 26 Ampelisca macrocephala

It is a burrowing form, living in smoothly lined tubes, which it constructs in the mud, and in the bottom of which it may generally be found. Length 10–15 mm. Color hyaline white.

Found in the sandy mud flats of Jamaica bay.

Calliopius laeviusculus (Kr.)

Amphithoe laeviusculus Kröyer. Grönlands Amphipoder. Danske Vid-Selsk. Afhandl. 7:281. pl.3, fig.13.

Calliopius laeviusculus Verrill. *l. c.* 1874. p.557. Sars. *l. c.* 1895. p.449, pl.158.

Antennulae and antennae subequal, the former without an accessory flagellum but with last peduncular segment produced into a lappet with caceolae. Flagellum of both pairs with many well marked articulations, which give it a serrate appearance. Gnatho-

poda rather large and subchelate. Terminal uropoda slightly larger than preceding, and with rami fringed with hairs and spines.

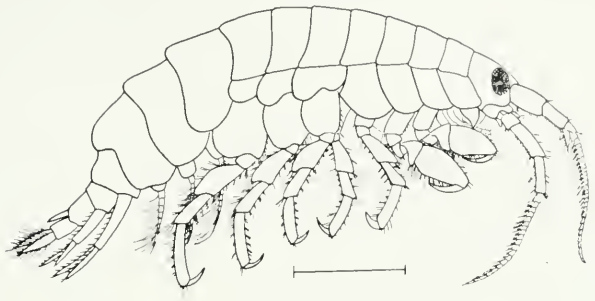

Fig. 27 Calliopius laeviusculus (After Sars)

Found, according to Smith, in tidal pools and among algae.
Length 10–14 mm. Color light green, whiter dorsally.
Taken at South Beach, S. I.

Family GAMMARIDAE

Antennulae and antennae long and slender, the former with an accessory appendage. Mandibles with a palp. Gnathopoda large and subchelate, generally stronger in the male. Pereiopoda more or less slender, the three posterior pairs gradually increasing in length. Terminal uropoda generally projecting beyond the others, biramous and with the rami more or less foliaceous. Telson small and more or less deeply cleft.

Gammarus locusta (Linn.)

Cancer locusta Linnaeus. Fauna Suecica. ed.2. p.497.
Gammarus locusta DeKay. *l. c.* 1844. p.37. Sars. *l. c.* 1895. p.499, pl.176.

Antennulae longer than antennae and with flagellum of latter shorter than peduncle. Gnathopoda small and equal in size. Pereiopoda with stiff spines. Last three segments of abdomen with median and lateral fascicles of spines. Third abdominal segment produced. Terminal uropoda with rami subequal and fringed with hairs and spines.

This is a littoral form and is the commonest of our Amphipoda, being found all along the shores of the bays, under stones which are covered at high water. It is not at all at home on land, but,

when the stone is raised, jerks itself along on its sides till it gets under some projecting surface. It is common all along the shores

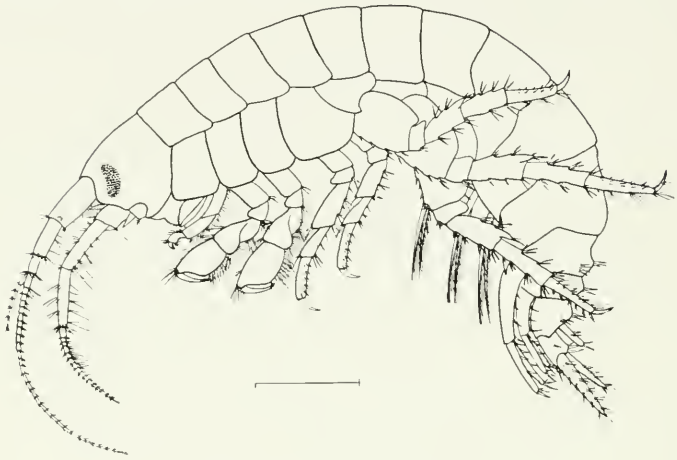

Fig. 28 Gammarus locusta

up to the Arctic regions, and farther north attains a larger size than it does here.

Length 10–13 mm. Color green and brown of varying shades.

Gammarus fasciatus Say

Gammarus fasciatus Say, T. *l. c.* 1818. 1:374. Smith, S. I. U. S. Fish Com. Rep't for 1872-73. 1874. p.653

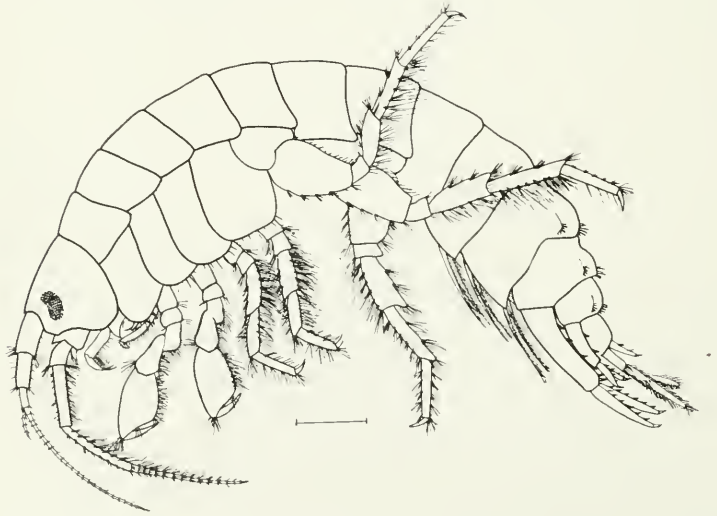

Fig. 29 Gammarus fasciatus

A fresh-water form with accessory flagellum on antennulae, and gnathopoda of moderate size in both sexes.

These two points are enough to distinguish this species from the only other fresh-water Amphipod, Allorchestes dentata. In addition, the last three segments of the abdomen are armed with median and lateral fascicles of spines, and the terminal uropoda are long and fringed with hairs. Length 10–15 mm. Color white with green markings.

Common in fresh-water ponds among the weeds, and in the brooks under stones.

Carinogammarus mucronatus (Say)

Gammarus mucronatus Say, T. *l. c.* 1818. 1:376. DeKay. *l. c.* 1844. p.37. Verrill. *l. c.* 1874. p.559.

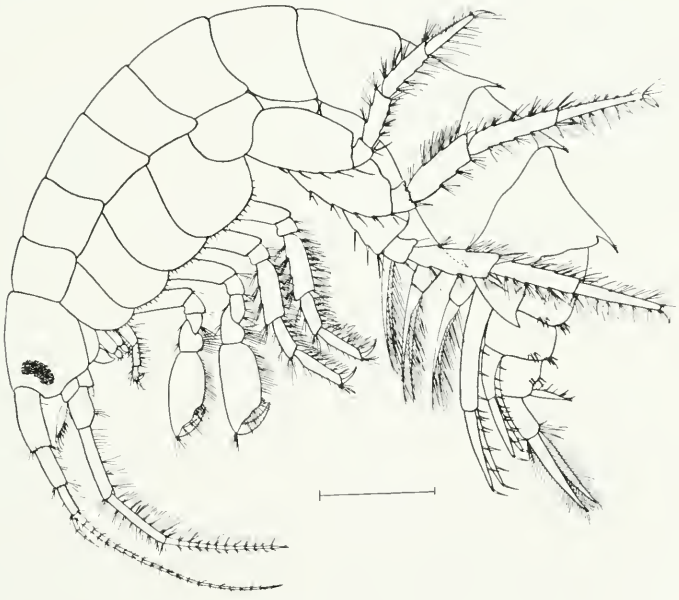

Fig. 30 Carinogammarus mucronatus

First three abdominal segments produced dorsally into acute teeth.

The above character will distinguish the present species from all of our other common Amphipoda. The antennulae are about equal in length to the antennae. Gnathopoda of moderate size in both sexes. Lower posterior angle of first three abdominal segments produced and last three furnished dorsally with median and lateral fascicles of spines.

This species lives in the brackish pools and in the marshes, and may be taken on the flats when the tide is out.

Length 15 mm. Color translucent, tinged with green, and with minute black or brown spots. Found all along the shores in suitable localities.

Melita nitida Smith

Melita nitida Smith. In Verrill. *l. c.* 1874. p.560.

Terminal uropoda with outer branch very elongate, inner branch much reduced. Dorsal part of abdominal segments not produced into teeth. Antennulae longer than antennae and two thirds length

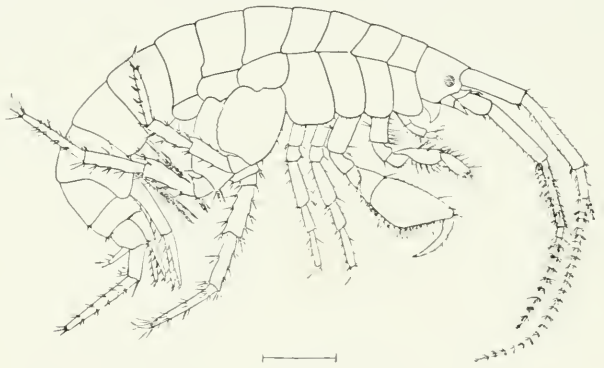

Fig. 31 Melita nitida

of body. Flagellum of antennae shorter than peduncle. Eyes round, black. First gnathopoda of male small with the dactyl very minute. Second gnathopoda larger and subchelate. First pereiopoda slightly longer than second; fifth and sixth equal and longer than fourth.

Length 7–9 mm. Color dark greenish slate.

Found but not commonly under rubbish between tides. Taken at Bartow and South Beach, S. I.

A somewhat smaller form probably occurs. This is M. dentata (Kr.), and it resembles nitida except that the posterior dorsal part of the abdominal segments is produced into small teeth.

Elasmopus laevis (Smith)

Moera laevis Smith. In Verrill. *l. c.* 1874. p.559.

Last three pereiopoda with joints broad and flat and armed with fascicles of hairs. Antennulae two thirds as long as body, flagellum

as long as peduncle and with accessory flagellum. Antennae as long as peduncle of antennulae. First gnathopoda small, second very much larger.

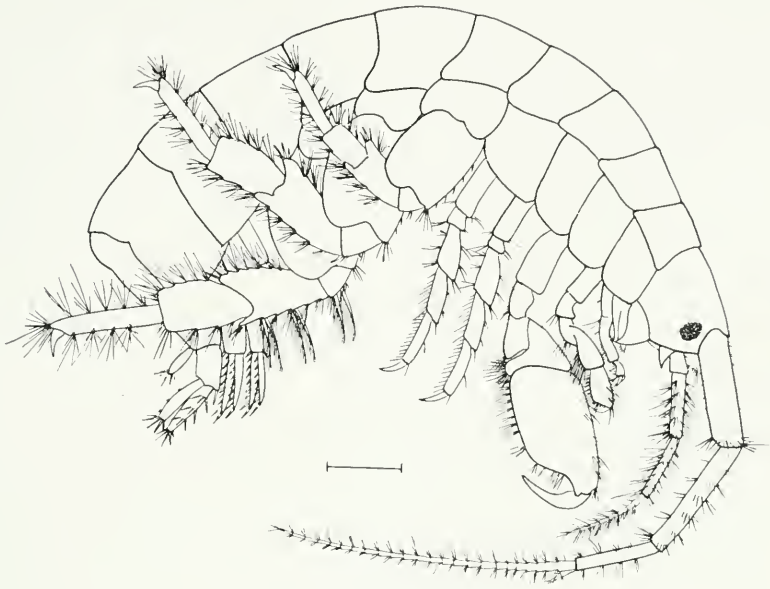

Fig. 32 Elasmopus laevis

Length 5–7 mm. Color whitish.

Found under stones and rockweed at low water mark. Taken at Bergen Beach.

Family PHOTIDAE

Antennulae elongated and slender, with or without a secondary flagellum. Antennae usually stouter than antennulae. Mandibles with a palp. Gnathopoda more or less unequal, one of the pairs being peculiarly modified in the male. Last pair of uropoda small and differing from preceding pairs. Telson tubular, receiving end of intestine.

Microdeutopus gryllotalpa Costa

Microdeutopus gryllotalpa Costa. Rend. d. Reale Acad. d. Sc. d. Napoli. 1853. p.178. Sars. *l. c.* 1895. p.543, pl.192, fig.2.

Antennulae longer than antennae, with secondary flagellum of one joint. Carpus of first gnathopoda of male very large and with three sharp teeth, propodus shorter, irregularly sinuated, dactylus strong, with minute denticulations. First gnathopoda of female

normal. Second gnathopoda of both sexes elongated and with small dactylus. Pereiopoda slender and elongated.
Occurs among hydroids and algae.

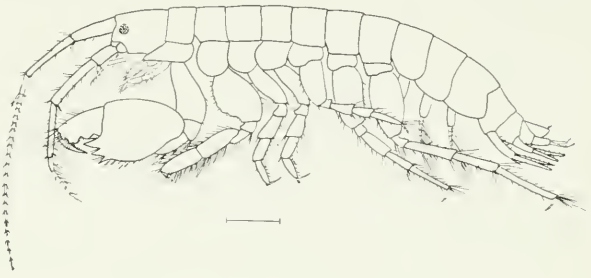

Fig. 33 Microdeutopus gryllotalpa (After Sars)

Length 6 mm. Color densely variegated with dark brown.
Taken at Bayshore and at Bartow.

Family PODOCERIDAE

Antennulae elongated, and either with or without a secondary flagellum, and generally smaller than the antennae, specially in the male. Gnathopoda more or less unequal, the posterior ones larger and sometimes enormously developed in the male. Coxae small, fifth pair with the anterior lobe much deeper than the posterior. Terminal uropoda stout, biramous or uniramous, and hooked. Telson small.

This family resembles the preceding, but the hooked terminal uropoda distinguish it.

Amphithoe valida Smith

Amphithoe valida Smith, S. I. In Verrill. *l. c.* 1874. p.563.

Antennulae without a secondary flagellum, slender and about equal in length to the antennae, and less than half length of body. Flagellum of antennae longer than ultimate joint of peduncle. First gnathopoda with carpus and propodus broad. Second gnathopoda in male with carpus short, propodus large and thick, broadest distally and with palm transverse, and with a broad, low tooth in the middle.

Length 10–13 mm. Color green, with numerous stellate pigment spots.

Found under stones and amid seaweeds and algae on the bottom. Two other species of Amphithoe will probably be taken; one, A. rubricata (Mont.), has the flagellum of the antennae often

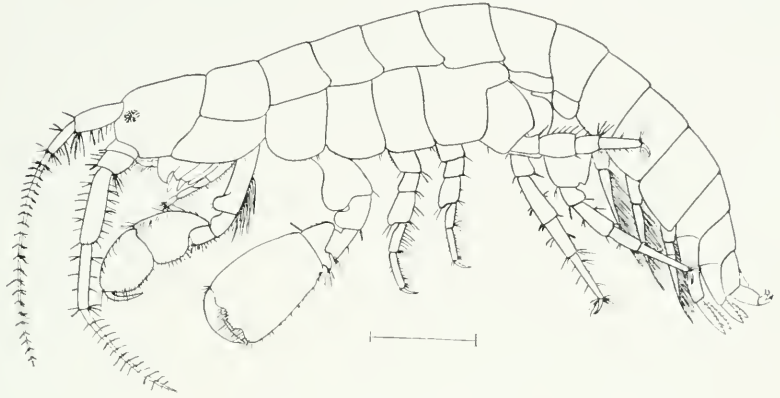

Fig. 34 Amphithoe valida

shorter than the ultimate joint of the peduncle, and the palm of the second gnathopoda oblique. In the other form, A. longimana Sm., the antennulae are as long as the body and the hands of the gnathopoda are stout and much elongated.

Jassa marmorata Holmes

Jassa marmorata Holmes, S. J. Am. Nat. 1903. 37:289.

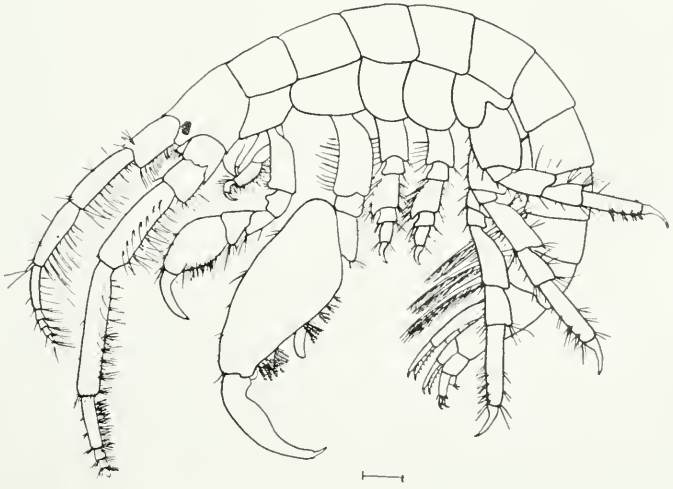

Fig. 35 Jassa marmorata, immature male

Antennulae with peduncle longer than flagellum and with secondary flagellum of one joint. Antennae longer and larger than antennulae, with flagellum shorter than ultimate joint of peduncle and with four joints. Gnathopoda of male elongated, the second much larger than the first and with hand very large, and with a stout tooth in the middle of the palm. The specimen figured is immature; the tooth is larger in the adult.

Found among hydroids and seaweeds on piles etc.

Length 5 mm. Color light, variously marked with dark gray.

Taken at Bayshore, in Great South bay and at City Island.

Unciola irrorata Say

Unciola irrorata Say, T. *l. c.* 1818. 1:389. DeKay. *l. c.* 1844. p.38.

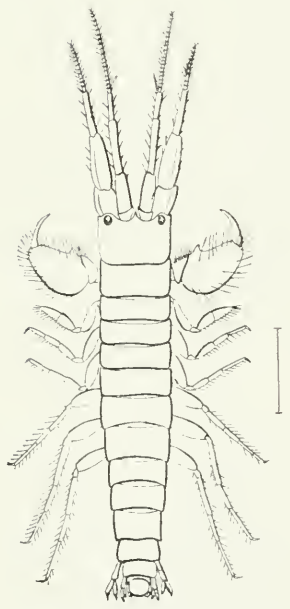

Fig. 36 Unciola irrorata (After Verrill)

Head produced in front into a rostrum. Antennulae with secondary flagellum and longer than antennae, which are stouter and subpediform. First gnathopoda large and subchelate in male, the palm longitudinal and with tooth at inferior end. Second gnathopoda smaller, not chelate, dactyl very small. Posterior limbs small.

A tube-dwelling form, sometimes inhabiting one of its own construction, but usually living in any empty tube it can find. Generally on rocky or shelly bottoms.

Length 10–15 mm. Color variable, light, irregularly spotted with red.

Taken all along the shore.

Family COROPHIIDAE

Body depressed, with abdomen poorly developed. Antennulae with or without a flagellum. Antennae usually much larger and stronger than antennulae and subpediform. Mandibles with palp. Coxal plates small and separated.

All the members of this family inhabit tubes, usually of their own construction, and, together with the preceding family, belong to the old division Domicola.

Corophium cylindricum (Say)

Podocerus cylindricus Say, T. *l. c.* 1818. 1:387. (Not of Bate. Cat. Amp. Crust. Brit. Mus. 1862. p.256)

Corophium cylindricum Verrill. *l. c.* 1874. p.566.

Antennulae, relatively to the antennae rather small, with flagellum slender and without secondary flagellum. Antennae of male with penultimate joint of peduncle greatly enlarged and with sharp tooth at distal end. Ultimate joint shorter, flagellum of two joints. Gnathopoda feeble, very similar in both sexes.

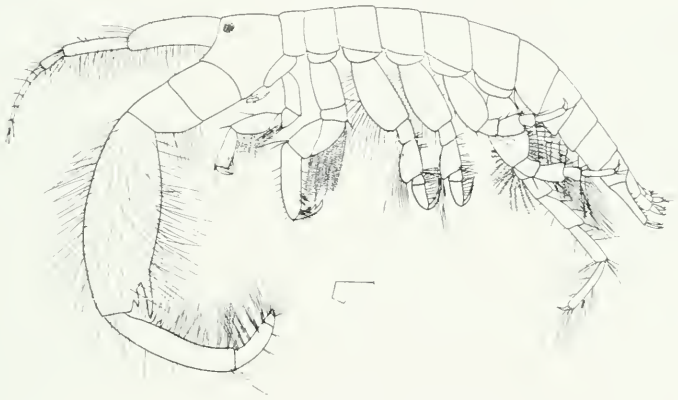

Fig. 37 Corophium cylindricum

This species inhabits soft tubes which are found in great numbers in sponges, algae etc. They can easily be obtained by pulling apart the pieces of the red sponge, Microciona prolifera, cast up on the beach.

Length 5 mm. Color light, mottled with gray.

Found all along the shore.

3 CAPRELLIDEA

An aberrant tribe which differs from the typical Amphipoda in the form of the body, which is either depressed or cylindric, and in the abdomen, which is rudimentary. It is divided into two families, 1, Caprellidae, cylindric forms, and 2, Cyamidae, or whale lice, which have a flat body. Specimens of the first family only have been taken.

Family CAPRELLIDAE

Amphipoda with a cylindric, flexible body. The head is fused with the first thoracic segment, though the line of fusion is indicated by a suture. There are two pairs of antennae, the first pair the larger. The gnathopoda are subchelate, the second pair much larger than the first. The next two pairs of pereiopoda are wanting in our forms, though present in some genera, but the segments bear lamellar gills and in the female a brood pouch. The three following are the walking legs. Abdomen very small and showing only rudiments of limbs.

The members of this family are usually found clinging to branches of hydroids or seaweeds by their posterior limbs. In their motions they somewhat resemble the larva of the geometrid moths, climbing over the branches by stretching out the body, catching hold by the anterior limbs and then drawing up the body in a loop. They also have the same habit of holding on by their posterior limbs and stretching their body out straight and stiff. They then resemble very closely the branches of the hydroid, and, as they are of a very similar color, it is difficult to detect them.

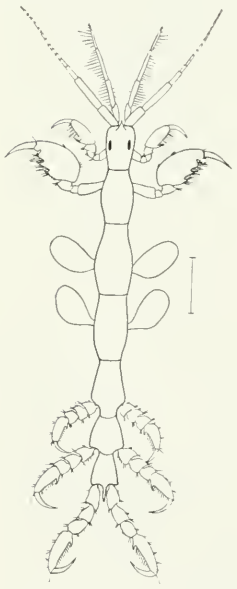

Fig. 38 Caprella geometrica

Caprella geometrica Say

Caprella geometrica Say, T. *l. c.* 1818. 1:390. DeKay. *l. c.* 1844. p.41. Verrill. *l. c.* 1874. p.567. pl.5. fig.20.

Head with a horizontally projecting spine. Mandibles without a palp. Body smooth and with short thick segments.

Length 8–10 mm. Color variable, usually resembling the object on which it is found.

Taken at South Beach S. I. on hydroids and algae on underside of stones.

Aeginella longicornis Kr.

Aeginella longicornis Kroyer.

Antennulae elongate, more than twice as long as antennae. Mandibles with a palp. Second gnathopoda with two large teeth on the palm. Body either smooth or thickly covered with short slender spines.

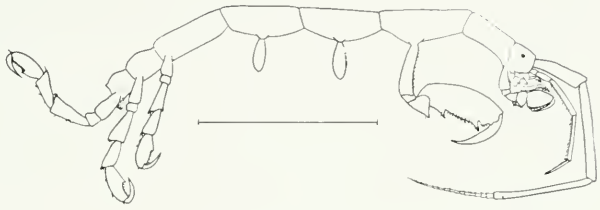

Fig. 39 Aeginella longicornis

Length 10–25 mm. Color variable.

Large specimens taken among hydroids in Great South bay. Smaller ones were taken all along the bays among hydroids and algae.

Suborder *b* ISOPODA

Arthrostraca with body flattened dorso-ventrally instead of laterally. The gills are borne on the abdominal appendages.

The antennulae and antennae are much as in the Amphipoda, the former with a peduncle of three, and the latter of five segments, and a flagellum. Eyes composed of groups of ocelli and nearly always sessile. The first thoracic appendage is a maxilliped, and the next seven (occasionally only six) are walking legs and usually all alike, whence the name Isopoda, or equal-footed. A part of the basal joint, or coxa, of the leg is fused with the dorsal part of the body and is known as the epimeron. A suture, known as the epimeral suture, usually shows the line of fusion. The abdominal segments are smaller than the thoracic and are frequently more or less united. The first five bear delicate lamellar appendages which function as breathing organs and the last pair are modified into uropoda.

Though not a large group, the members of the Isopoda are probably more widely distributed than any other of the Crustacea.

They are found under rocks and logs on the shore, or burrowing in the sand or in timber. Other forms are pelagic or cling to floating seaweeds, eelgrass or the hydroids on piles. Many forms are parasitic. Some are found in fresh water and still others, probably the most familiar to the casual observer and known as sowbugs or pill-bugs, are found under stones on land or under bark.

The principal paper on the marine Isopoda is by Harger, "Report on the Marine Isopoda of New Engand and Adjacent Waters," *U. S. Fish Com. Report for 1878*, Washington, 1880. This contains descriptions and figures of most of the species mentioned in the following.

A key to the Isopoda of North America was published by Harriet Richardson in the *American Naturalist*, 1900, 34: 207–30, 295–309. This was incorporated in the "Key to the Isopods of the Atlantic Coast of North America, with Descriptions of New and Little Known Species," by the same author and published in *Proc. of the U. S. Nat. Mus. 1901*, 23: 493–579. A bibliography of American forms is there given.

Say's work mentioned before [p. 125] gives descriptions of several of our forms; and Sars, in the *Crustacea of Norway*, figures several cosmopolitan species which occur here. References to Verrill's *Invertebrates of Vineyard Sound* are also given.

1 CHELIFERA

Distinguished from all other Isopoda by the first pair of legs or gnathopoda being chelate. Pleopoda when present, natatory. Uropoda terminal, with a short basal part and one or two terminal filaments. Respiration thoracic.

A very anomalous group which differs in several respects from the typical Isopoda and by some authors has been entirely removed from the order. Divided into two families, of which one is represented. 1 Tanaidae, 2 Apseudidae.

Family TANAIDAE

Body cylindric. Antennulae close together, short in female, much longer in male, with minute rudiment of a flagellum and without secondary flagellum. Antennae shorter with flagellum generally biarticulate. Uropoda short.

Leptochila dubia (Kr.)

Tanais dubius Kröyer. Nat Tidsskr. 4:178, pl.2, fig.20-22.
Tanais filum Verrill. *l. c.* 1874. p.573.
Leptochila algicola Harger. *l. c.* 1880. p.421, pl.12-13, fig.80, 83-86.

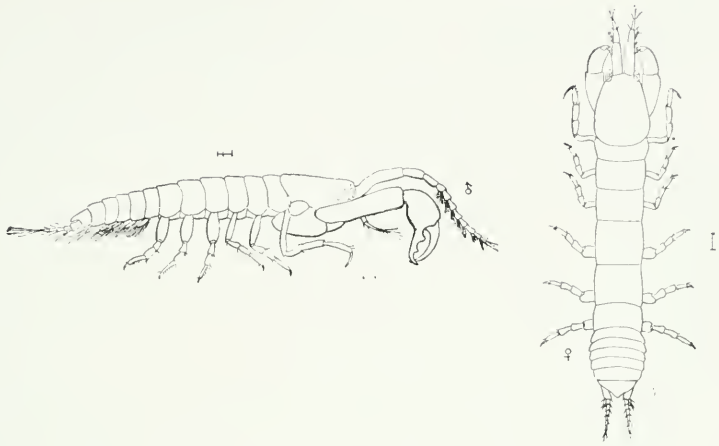

Fig. 40 Leptochila dubia *a*, male; *b*, female (After Harger)

Pereion with six segments. Gnathopoda stout, uropoda with short, one jointed outer, and a six jointed inner ramus. Female with antennulae and gnathopoda shorter than in male.

Occurs among eelgrass and on piles.

Length 2.2 mm. Color nearly white.

Taken at Bayshore.

Leptochila rapax Harger

Leptochila rapax Harger. *l. c.* 1880. p.424, pl.13, fig.89-90.

Pereion with six segments. Gnathopoda of male very slender and elongated. Inner ramus of uropoda five jointed. Female very similar to L. dubia, but the five jointed uropoda will distinguish it.

A tube-inhabiting form, living in the mud.

Length: male 2.6–3.8 mm, female 2.3 mm. Color white.

Taken at Bayshore.

Fig. 41 Leptochila rapax male (After Harger)

2 FLABELLIFERA

Uropoda lateral, forming with the last segment, a tail fin. Pleopoda generally of the character of swimming organs, though serving partly for respiration.

A group of Isopoda exhibiting very diverse characters. It is divided into 11 families, of which 3 have common representatives.

Family ANTHURIDAE

Body cylindric, narrow and elongated. Uropoda lateral and superior, outer branch arching over base of telson.

Cyathura carinata (Kr.)

Anthura carinata Krøyer. Nat. Tidsskr. (2). 2:402.
?Anthura gracilis DeKay. *l. c.* 1844. p.44, pl.9, fig.34.
Anthura brunnea Verrill. *l. c.* 1874. p.572.
Anthura polita Harger. *l. c.* 1880. p.398, pl.11, fig.68-69.
Cyathura carinata Richardson. *l. c.* 1901. p.508.

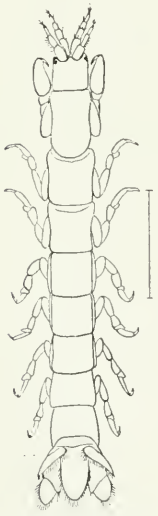

Fig. 42 Cyathura carinata (After Harger)

Segments of the pleon fused so as to resemble an eighth thoracic segment. Terminal uropoda bent so as to resemble a cup or "flower". Antennulae and antennae similar, short and stout, with very small flagellum. A bottom form living in sand and mud.

Length 15–18 mm, breadth 1.8–2 mm. Color brownish, mottled with yellow.

Taken at Bergen Beach on sand flats.

A somewhat similar species, Anthura tenuis (Harger) may possibly be found in the same localities. It is smaller than the above, measuring 11 mm, and the antennulae of the male are very hairy, resembling bottle brushes.

Family CYMOTHOIDAE

Parasitic, usually on fish. Head projecting over base of antennulae, which, like the antennae are short and tapering with but little distinction into peduncle and flagellum. Dactylus of feet curved and adapted for fastening to the body of the fish.

Aegathoa loliginea Harger

Aegathoa loliginea Harger. Am. Jour. Sci. Ser. 3, 1878. 15:376. Harger. *l. c.* 1880. p.393, pl.10, fig.66. Richardson. *l. c.* 1901. p.520.

Front of head evenly rounded, eyes very large. Antennae 10 jointed. First thoracic segment longer than others, which are equal in length. Legs armed with strong curved claws. Pleon long and large, uropoda slightly ciliated. (The uropoda in the specimens taken were like the right uropod in the figure.)

Parasitic in the mouth of the squid usually, but taken on bluefish in Great South bay.

Length 13 mm, breadth 3.6 mm. Color in alcohol, yellow with minute black spots.

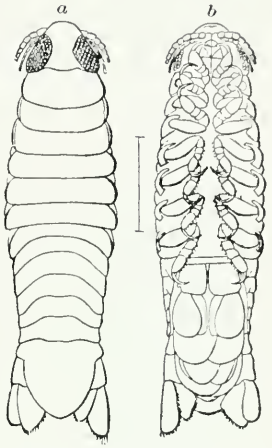

Fig. 43 Aegathoa loliginea (After Harger)

Livoneca ovalis (Say)

Cymothoa ovalis Say, T. *l. c.* 1818. 1:394.
Cymothoa triloba DeKay. *l. c.* 1844. p.46, pl.10, fig.40.
Livoneca ovalis Verrill. *l. c.* 1874. p.572. Harger. *l. c.* 1880 p.395. Richardson. *l. c.* 1901. p.531.

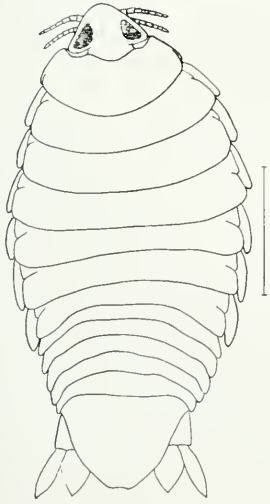

Fig. 44 Livoneca ovalis

A parasitic Isopod, with body broadly oval and more or less distorted. Dorsal surface moderately convex. Feet pressed closely to the body and concealed; the first three pairs pointing forward, the last four backward.

They are found clinging to the roof of the mouth or to the gills of fishes. The bluefish is the usual host, but it occurs on other forms, such as the scup.

Length 15–22 mm, breadth 10–12 mm. Color light with minute, short, dark lines, which may be numerous enough to give the animal a very deep color.

Family SPHAEROMIDAE

Body short and convex. Head broad and transverse. Antennulae and antennae multiarticulate and distinctly divided into peduncle and flagellum. Anterior segments of pleon short with segments united.

Cassidina lunifrons Richardson

Cassidina lunifrons Richardson. Am. Nat. 1900. 34:222. U. S. Nat. Mus. Proc. 1901. 23:533. fig.14.

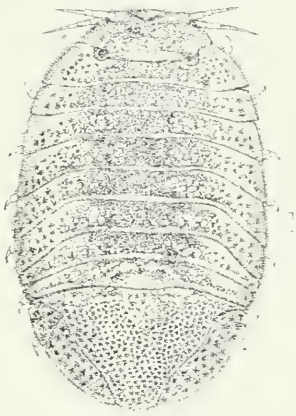

Fig. 45 Cassidina lunifrons

A small species with broad, elliptic body. Head broader than long and set into thorax, eyes at posterior lateral corners. Terminal segment large and truncate. Inner branch of uropoda pointed and reaching tip of abdomen, outer branch one fourth longer than inner. Legs short and equal.

Found below high water mark in muddy situations, clinging to the underside of boards and bark. Usually covered with mud so that its color can not be recognized.

Length 1 mm. Color yellowish brown with many small, dark brown and blackish spots.

Taken at Bartow and at Fresh Kills, S. I.

Sphaeroma quadridentatum Say

Sphaeroma quadridentatum Say, T. Acad. Nat. Sci. Phila. Jour. 1818. 1:400. Verrill. *l. c.* 1874. p.569. Harger. *l. c.* 1880. p.368, pl.9, fig.53-54. Richardson. *l. c.* 1901. p.533.

A littoral form which may be distinguished from other marine Isopoda by its habit of rolling itself up into a round ball when disturbed, like the land "pill-bugs". Body broad and elliptic. Terminal segment rounded, branches of uropoda subequal and extending beyond tip of terminal segment.

Found on the underside of rocks, between tides.

Length 8 mm, breadth 4 mm. Color very variable, some slaty gray or marked on the back with a whitish, cream-colored or rosaceous longitudinal patch bordered more or less with black. The color is evidently protective, as it matches closely the rocks on which the animals are found.

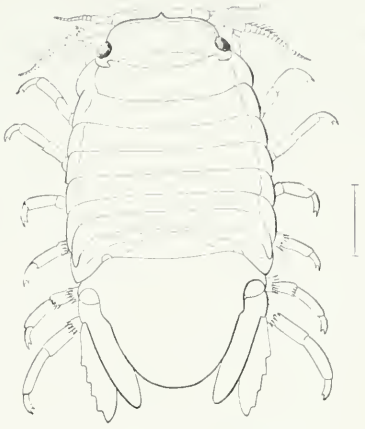

Fig. 46 Sphaeroma quadridentatum (After Harger)

Taken at Bartow. Another smaller species, as yet undescribed, and apparently belonging to this genus, has been found swimming around in the small pools left by the tide, at City Island and on Staten Island.

3 VALVIFERA

Uropoda ventral, arching over and protecting the pleopoda, which are delicate and mostly branchial in character.

Of the three families one is represented.

Family IDOTEIDAE

Antennulae of four segments, the basal segment enlarged and the terminal one clavate.

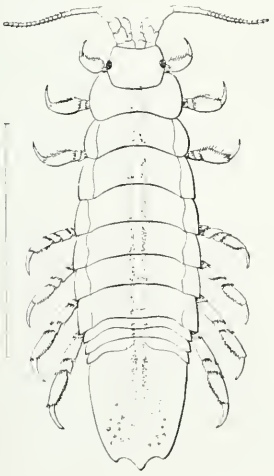

Fig. 47 Idotea marina (After Harger)

Pleon with more or fewer of its segments consolidated into a scutiform tailpiece.

Idotea marina (Linn.)

Oniscus marinus Linnaeus. Fauna Suecica. 1761. p.500.

Stenosoma irrorata DeKay. *l. c.* 1844. p.43, pl.10, fig.42.

Idotea irrorata Verrill. *l. c.* 1874. p.569, pl.5, fig.23. Harger. *l. c.* 1880. p.343, pl.5, fig.24-26.

Idotea marina Richardson. *l. c.* 1901. p.540.

Body with sides nearly parallel. Antennulae short, of four segments. Antennae longer, with multiarticulate

flagellum longer than peduncle. Pleon apparently consisting of four segments, the first three short, the last long and tridentate. Length: males 30–36 mm, breadth 8–9 mm; female smaller, rarely exceeding 20 mm.

Color very variable, frequently a uniform light or dark green or brownish with minute black punctations. Very often there is a dorsal stripe. Rarely the colors are arranged in transverse bands and blotches. Females usually darker than males, often with a light lateral stripe.

Found on the seaweed on rocky shores or in eelgrass where its color is protective. Sometimes found far from land on floating seaweed. Common all along the shore.

Idotea phosphorea Harger

Idotea phosphorea Harger. U. S. Com. of Fish and Fisheries. Rep't. 1874. p.569 (275). *l. c.* 1880. p.347, pl.5, fig.27-29. Richardson. *l. c.* 1901. p.541.

Body with sides parallel. Antennulae short, of four segments. Antennae longer, with multiarticulate flagellum, which is shorter and stouter than in preceding species. Pleon apparently consisting of four segments, the first three short, the last pointed.

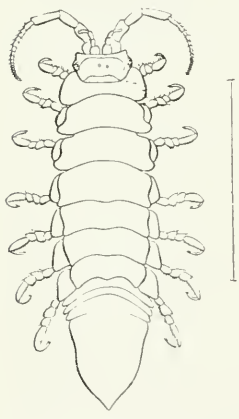

Fig. 48 Idotea phosphorea (After Harger)

The young of this species resemble the young of the preceding, but may be distinguished by the epimeral sutures not crossing entirely the second and following segments.

Length 25 mm, breadth 7 mm. Color varied, dark green or brownish with patches of yellow or whitish, not striped as in I. marina.

Found among the rocks and seaweed along with the last, but much more rarely, being a more northern form. Small specimens taken at South Beach, S. I.

Another species, Idotea metallica Bosc, (I. robusta of Verrill and Harger) will probably be taken. It may be distinguished by the truncate terminal abdominal segment.

Edotea triloba (Say)

Idotea triloba Say, T. Acad. Nat. Sci. Phila. Jour. 1818. 1:425.
Epelys trilobus Verrill. *l. c.* 1874. p.571. Harger. *l. c.* 1880. p.358, pl.7, fig.42-43.
Edotea triloba Richardson. *l. c.* 1901. p.545.

Body flat, elongated in form and the lateral edges of the segments smoothly rounded. A depressed line runs from the posterior lateral angles of the head across all the segments to the pleon. Pleon consisting of a single piece pointed at the end. Antennulae and antennae short.

Length 6 mm, breadth 2.3 mm. Color uniform, dull.

Found under stones or creeping over the bottoms or amidst and beneath the decaying vegetable matter in sheltered situations.

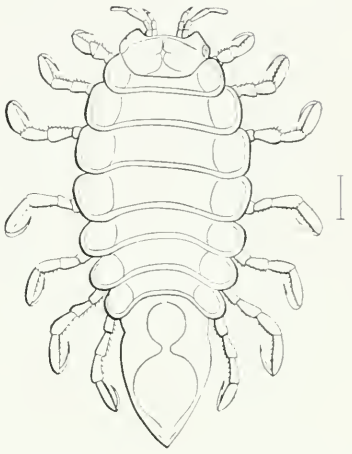

Fig. 49 Edotea triloba (After Harger)

Taken on eastern shore of Staten Island.

4 ASELLOTA

Segments of pleon fused into a shieldlike plate. Pleopoda exclusively branchial and reduced in number. Uropoda terminal as in Chelifera and biramous. Antennulae small, antennae sometimes very large. Five families, two represented.

Family ASELLIDAE

Mainly fresh-water forms, distinguished by the pleopoda, which number in the female four pairs, the first very small and not operculiform, the rest biramous, the second pair forming an operculum for the last two. In the male there are five pairs, an additional pair, the copulatory appendages, being interposed between the first and second pairs.

Asellus communis Say

Asellus communis Say, T. *l. c.* 1818. 1:427. DeKay. *l. c.* 1844. p.49. Smith, S. I. U. S. Fish Com. Rep't for 1872-73. 1874. p.657. pl 1. fig.4. Richardson. *l. c.* 1901. p.551.

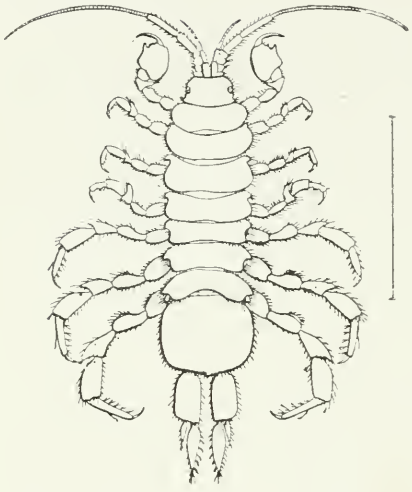

Fig. 50 Asellus communis (After Smith)

A fresh-water form. Body with sides parallel. Antennulae short and flagellum with several segments. Antennae more than half length of body. First pair of legs of male chelate, last three pairs longer than the preceding. Pleon large, squarish and in one piece: uropoda elongated and flattened.

Length 15 mm, breadth 5 mm. Color brown, spotted and mottled with yellowish.

The only fresh-water Isopod found in New York city. Occurs under stones in brooks and ponds everywhere.

Family JANIRIDAE

Marine forms, much like Asellidae. The first pair of pleopoda in the female are a large opercular plate. To the corresponding plate of the male the copulatory appendages are joined laterally, succeeding pairs delicate.

Jaera marina (Fab.)

Oniscus marinus Fabricius. Fauna Grönlandica. p.252.
Jaera copiosa Verrill. *l. c.* 1874. p.571.
Jaera albifrons Harger. *l. c.* 1880. p.315. pl.1, fig.4-8.
Jaera marina Richardson. *l. c.* 1901. p.554.

Body oval, slightly more than twice as long as broad. Antennulae short, antennae more than half the length of body and with multiarticulate flagellum. Pleon in one piece, semicircular, with short uropoda rising from a notch in the end.

Length 5 mm, breadth 2 mm, males about one third shorter and somewhat narrower. Color very variable, slaty gray with blotches

of yellow and reddish brown. Some are light colored or nearly white, often with two or more transverse bands, forming a striking looking animal. Very frequently also shades of light or dark green occur, and the incubatory lamellae of the female are often bright green.

Very common all along the shore below high tide on rocks under seaweeds where their color is protective, or clinging to the undersides of stones or boards. Frequently found in the little pools left on the rocks by the tide.

Found commonly all along the coast.

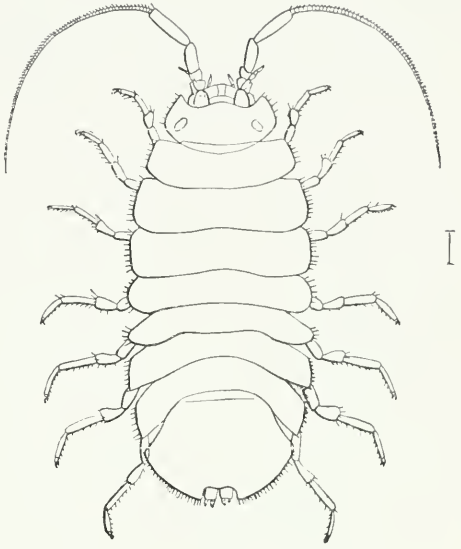

Fig. 51 Jaera marina (After Harger)

5 ONISCOIDEA

The tribe Oniscoidea is almost unique among Crustacea in being entirely terrestrial, even the early stages being passed on land. They are oval forms with a more or less depressed body, and the fused head and first thoracic segment are sunk in the second. The first antennae are very small, three-jointed and placed on the front of the head. The second antennae are long and consist of a peduncle of five, and a flagellum of two or three segments.

They breathe by lamellar gills which are processes of the abdominal limbs, and in consequence they require a rather damp atmosphere.

Their colors are usually dull, brown or dark gray being the prevailing tones; but they are very variable, even in the same species, and color is not to be relied on as a means of identification. In fact a large number of species have been described at various times with color as their main specific character, and many of them have had to be thrown out.

They are more or less gregarious and are found, frequently in considerable numbers, in damp situations, as under logs and stones which have lain on the ground for some time, or under bark or in crevices of trees or in moss.

Many of the species are world-wide in distribution, and a number seem to prefer the vicinity of human habitations, old greenhouses being a favorite resort.

They are commonly known as sow-bugs, pill-bugs, wood lice or slaters and are probably familiar to everyone. In spite, however, of their commonness, little appears to be known of their habits. According to Fitch, their only economic value is as a food for fowls; but in former times they found much favor as a medicinal agent, being used either dried and pulverized or made into an infusion with "Rhenish wine."

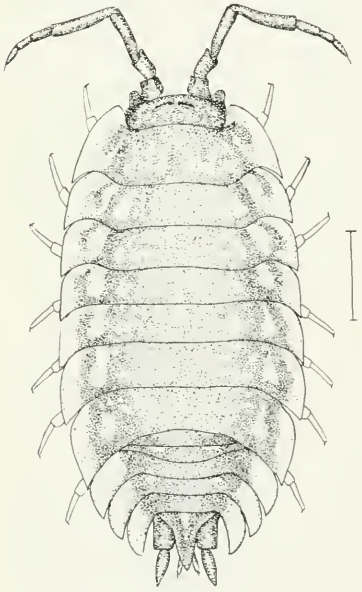

Fig. 52 Oniscus asellus

Family ONISCIDAE

Antennae generally long. Body not usually able to be contracted into a ball. Uropoda long and reaching beyond terminal segment, which is generally conically produced.

Oniscus asellus Linn.

Oniscus asellus Linnaeus. Fauna Suecica, ed.2, p.500. DeKay. *l. c.* 1844. p.51, pl.6, fig.12. Sars. *l. c.* 1899. v.2, p.171, pl.75. Richardson. *l. c.* 1901. p.562.

Flagellum of antennae three jointed; head produced under eyes.

This and the following species differ from all the rest of our terrestrial Isopods in having the flagellum of the antennae with three joints instead of two. From Philoscia it differs in the greater size and in the lateral angles of the head under the eyes being produced into lobes.

Length 12–18 mm. Color deep slate, the lamellar edges white and a row of white spots within the edge.

Found under the bark of dead trees or under logs and stones and in greenhouses. Occurs all over the city.

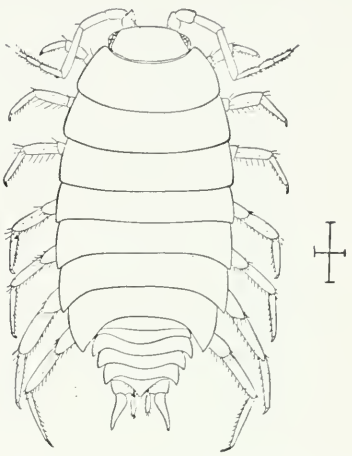

Fig. 53 Philoscia vittata (After Harger)

Philoscia vittata Say

Philoscia vittata Say. *l. c.* 1818. p.429. DeKay. *l. c.* 1844. p.50. Harger. *l. c.* 1880. p.306, pl.1, fig.1. Richardson. *l. c.* 1901. p.565.

Flagellum of antennae three jointed; head rounded.

A much smaller species than the preceding, from which it differs in the lack of the projections under the eyes. The abdominal segments are narrower in comparison with the thoracic than in the other terrestrial forms.

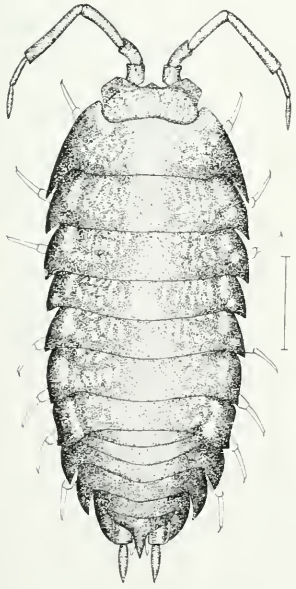

Fig. 54 Cylisticus convexus

Length 8 mm, breadth 4 mm. Color variable, usually brownish with two darker streaks along the median line.

This species is said by Say to be "very common under stones, wood etc. in moist situations," but according to Harger it occurs near the shore under rubbish. The only specimens taken by the writer were found at Freeport L. I., in April, where they were abundant on the underside of boards above high water.

Cyclisticus convexus (DeGeer)

Oniscus convexus DeGeer. Mém. des Insectes. 7:553, pl.35, fig.11.

Cyclisticus convexus Budde-Lunde. Crust. Isop. Terrestria. 1885. p.77-79. Sars. *l. c.* 1899. 2:186, pl.81. Richardson. *l. c.* 1901. p.566.

Body very convex and smooth, capable of being rolled into a round ball. Uropoda long and pointed.

This species, like Armadillidium, has the habit of rolling itself into a ball when handled or disturbed, and they have thus obtained the name pill-bugs. From Armadillidium it differs in having long and pointed uropoda. From the rest of the Oniscoidea it differs in its convex and more elongated form and its ability to form a ball. The body also lacks the tubercles usually found in the genus Porcellio.

Length 10–12 mm. Color chocolate brown or dark gray with a submarginal row of white spots, within which is a large mass of smaller, irregular markings. No median stripe. The markings of this species are fairly constant.

It is rather rapid in its movements, running off and hiding under any sheltering object. If handled it rolls itself up into a very perfect ball and is difficult to distinguish from pebbles. Found in woods under logs or along roads under stones, usually in rather dry situations.

Common all over the city.

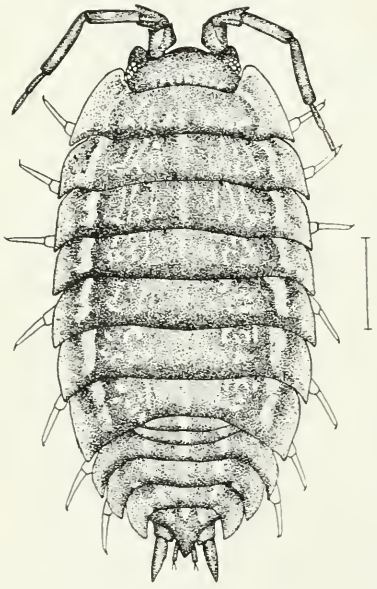

Fig. 55 Porcellio rathkei

Porcellio rathkei Brandt

Porcellio rathkei Brandt. Bul. de la Soc. Imp. d. Naturalistes de Moscou 1833. 6:15. Sars. *l. c.* 1899. 2:180, pl.79. Richardson. *l. c.* 1901. p.567.

Joints of flagellum of antennae subequal, color variable but usually with median and lateral stripes.

The commonest as well as the most variable of our terrestrial Isopoda. In form it is only moderately convex, and the dorsal surface is covered with small tubercles. The front is smoothly rounded, and the uropoda are moderately long.

Length 10–12 mm. Color brown, with two lateral, and usually a median light stripe. Besides these, there are two rows of markings which are very variable, sometimes being long and sinuous and sometimes merely irregular blotches. In some specimens all traces of a regular pattern disappear, and the body is covered with a mass of irregular brown, black and white spots.

Very common under stones, boards etc. everywhere in the city.

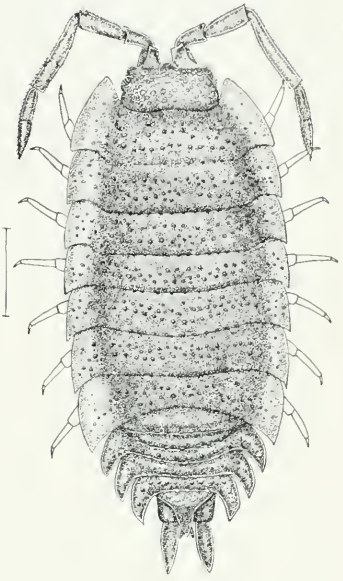

Fig. 56 Porcellio scaber

Porcellio scaber Latreille

Porcellio scaber Latreille. Hist. Nat. des Crus. et des Insectes. 7:45. Sars. *l. c.* 1899. 2:176, pl.77. Richardson. *l. c.* 1901. p.568.

Tubercles large and numerous, color nearly uniform.

In this species the entire body is covered with tubercles which are specially large on the head. The lobes under the eyes are well developed, and the front is slightly produced. The terminal joint of the antenna is slightly shorter than the preceding.

Length 12–15 mm. Color generally a uniform black or very dark gray, with traces occasionally of two lateral rows or markings.

Found under stones, logs or bark in rather dry situations. Occurs all over the city but not commonly.

Metaponorthus pruinosus (Brandt)

Porcellio pruinosus Brandt. Bul. de la Soc. Imp. d. Naturalistes de Moscou. p.19.

Metaponorthus pruinosus Sars. *l. c.* 1899. 2:184, pl.8, fig.2. Richardson. *l. c.* 1901. p.569.

Lateral lobes of head small, front nearly straight; body smooth and flattened.

A small species somewhat resembling in form and in the narrow abdomen Philoscia vittata, from which it may be distin-

guished by the biarticulate flagellum of the antennae. It differs from Porcellio in the smallness of the lateral lobes of the head and in the absence of any projection between the eyes. Antennae long and delicate. Integument soft and thin.

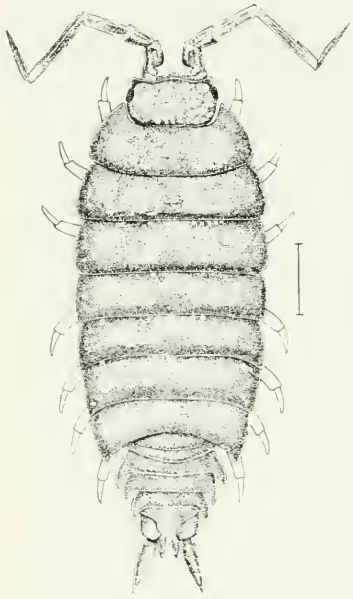

Fig. 57 Metaponorthus pruinosus

Length 8–12 mm. The color of living animals is silvery, but in alcohol it is brown with irregular lighter spots and streaks. The antennae are distinctly banded, the distal portion of each joint being lighter than the base.

They are very active forms and are what might be called domesticated, being found in greenhouses or along walls, usually under decaying vegetable matter.

Found all over the city.

Family ARMADILLIDIDAE

Antennae generally short. Body able to be contracted into a ball. Uropoda not reaching beyond terminal segment, which is short and broad.

Armadillidium vulgare (Latreille)

Armadillo vulgaris Latreille. Hist. Nat. des Crus. et des Insectes. 7:48. DeKay. *l. c.* 1844. p.5.

Armadillidium vulgare Richardson. *l. c.* 1901. p.574.

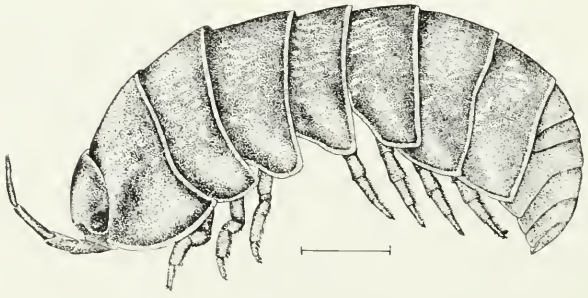

Fig. 58 Armadillidium vulgare

Body very convex and capable of being rolled into a ball. Uropoda short.

Another form which, like Cyclisticus, can roll itself into a perfect ball, and is thus known as a pill-bug. From that and all of our other terrestrial Isopoda it differs in the shape of the terminal uropoda, which are short and do not extend beyond the edges of the adjoining segments. Antennae short. Integument thick and heavy.

Length 10–12 mm. Color dark gray or nearly black with rows of indistinct, irregular spots.

Not very common, but specimens have been taken at Bayshore, and it will probably be taken within the city limits. Occurs under stones and boards.

EPICARIDEA

Forms which, as their names indicate, are parasitic on other Crustacea. Owing to their mode of life, their structure is very much modified and degraded, the extent to which it is carried varying in the different species. The males are relatively to the females very small and are found clinging to the body of the female. Of the four families one, the least degenerate, is represented.

Family BOPYRIDAE

Body of female distinctly segmented, asymmetric and flattened dorsally. Male more slender and symmetric.

Parasitic on decapodous Crustacea.

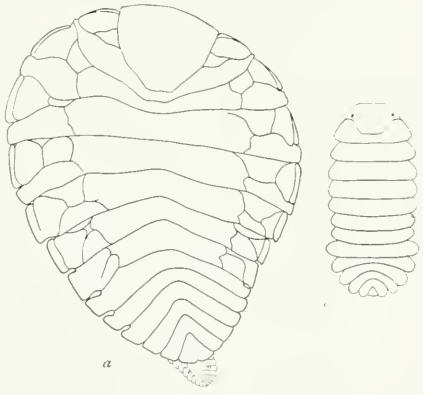

Fig. 59 Probopyrus palaemoneticola: *a*= female with attached male, *b*=male.

Probopyrus palaemoneticola (Packard)

Bopyrus palaemoneticola Packard. Zoology for High Schools and Colleges. 1881. p.289.

Bopyrus sp. Harger. *l. c.* 1880. p.312.

Probopyrus palaemoneticola Richardson. U. S. Nat. Mus. Proc. 1904. 27:66, fig.41-43.

Found under the carapace of Palaemonetes vulgaris, where it produces large tumors.

The female is eyeless and somewhat distorted and lies with the flattened dorsal region against the body of the host. The ventral side consists mainly of a large incubatory pouch filled with eggs. Male very small, with eyes, and usually to be found clinging to the female as in the figure.

Length of female 5 mm. Color white with black markings.

Found on the Palaemonetes along the shore.

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JOHN M. CLARKE Director

Bulletin 87

ARCHEOLOGY 10

PERCH LAKE MOUNDS

WITH NOTES ON OTHER NEW YORK MOUNDS, AND SOME ACCOUNTS OF INDIAN TRAILS

BY

WILLIAM M. BEAUCHAMP S.T.D.

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New York State Education Department

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JOHN M. CLARKE Director

Bulletin 87

ARCHEOLOGY 10

PERCH LAKE MOUNDS

WITH NOTES ON OTHER NEW YORK MOUNDS, AND SOME ACCOUNTS OF INDIAN TRAILS

LIST OF AUTHORITIES

Abbreviations at the left are used in the bulletin in exact reference to works in the following list.

Amidon	**Amidon, R. W.** •Letter to Rev. Dr Beauchamp.
Beauchamp	**Beauchamp, W. M.** The Aborigines. Jefferson County Hist. Soc. Trans. Watertown 1887.
Benedict	**Benedict, A. L.** Mound Builder Remains on Cattaraugus Creek, Erie county, N. Y. American Antiquarian. Chicago 1901.
Boyle	**Boyle, David.** Annual Archaeological Reports, 1901 and 1903. Toronto.
Cammerhoff	**Cammerhoff, Frederick.** Diary of the Journey of Bro. Cammerhoff and David Zeisberger to the Five Nations from May 3–14 to August 6–17. Manuscript.
Cecil	**Cecil, Harry B.** Letter to Rev. Dr Beauchamp.
Clark	**Clark, John S.** Notes in various papers.
Emerson	**Emerson, Edgar E.** Our Country and its People. Boston 1898.
French	**French, J. H.** Gazetteer of New York. Syracuse 1860.
Getman	**Getman, A. A.** Letters to Rev. Dr Beauchamp.
Harris	**Harris, George H.** Aboriginal Occupation of the Lower Genesee Valley. Rochester 1884. First issued in *Semi-centennial History of Rochester*, ch. 1 15. Rochester 1884.
Hough	**Hough, F. B.** History of Jefferson County. Albany 1854.
Jennings	**Jennings, C. P.** Letter to Rev. Dr Beauchamp.
Jordan	**Jordan, J. W.** Spangenberg's Notes of Travel to Onondaga in 1745. Pa. Mag. Hist. and Biog. v. 2. Phil. 1878.
Mackay	**Mackay, John.** Letter to Rev. Dr Beauchamp.
Marvin	**Marvin, D. S.** Mounds at Perch Lake, Jefferson County. Jefferson County Hist. Soc. Trans. Watertown 1887.
Mattern	**Mattern, J. E.** Letter to Rev. Dr Beauchamp.

Mayhew — **Mayhew, G. F.** Bulletin of Natural History of New Brunswick. St Johns N. B. 1884.

Morgan — **Morgan, L. H.** League of the Ho-de-no-sau-nee or Iroquois. Rochester 1851.

O'Callaghan — **O'Callaghan, E. B.** Documents Relative to the Colonial History of the State of New York. Alb. 1853–87.

Putnam — **Putnam, F. W.** 11th Report of Peabody Museum; quoted by Cyrus Thomas in Report on the Mound Explorations of the Bureau of Ethnology. Wash. 1894.

Relations — **Relations** des Jésuites. Quebec 1858.

Skinner — **Skinner, A. B.** Letter to Rev. Dr Beauchamp.

Smith — **Smith, Harlan I.** Letter to Rev. Dr Beauchamp.

Thomas — **Thomas, Cyrus.** Report on the Mound Explorations of the Bureau of Ethnology. U. S.—Ethnology, Bureau of. 12th An. Rep't. Wash. 1894.

Twining — **Twining, J. S.** Letter to Rev. Dr Beauchamp.

Wallbridge — **Wallbridge, Thomas C.** On some Ancient Mounds upon the Shores of the Bay of Quinté. Can. Jour. of Industry, Science and Art. Toronto 1860.

Wilson — **Wilson, James Grant.** Arent Van Curler and his Journal of 1634–35. Am. Hist. Ass'n. An. Rep't. 1895. Wash. 1896.

Woodworth — **Woodworth, Henry.** Letter to Rev. Dr Beauchamp.

Zeisberger — **Zeisberger, David.** David Zeisberger's and Henry Frey's Journey and Stay in Onondago from April 23d to November 12th, 1753.
Manuscript.

PERCH LAKE MOUNDS

In all histories of Jefferson county, N. Y. there are slight notices of the curious mounds about Perch lake. When Squier wrote his account of the antiquities of New York they had not attracted attention, for they were inconspicuous and remote from ordinary travel. Mr F. B. Hough seems to have been the first to mention them, a few years later, and he said there were several at the mouth of Lowell creek, Perch lake, about 30 feet across and with depressed centers. No creek is now known by this name to the oldest inhabitants, but he probably meant Hyde creek at the head of the lake, where there are yet a number. He added that there are some on Linnell's island. In these were found pottery, burnt stone and charred corn. *Hough,* p.10

Linnell's island is not in the lake, but is an extensive elevation in the great swamp west of its foot and north of the outlet, as shown in plate 1. It lies between two large streams and is now occupied by farms. Some mounds still remain on those owned by Messrs Gailey and Klock. No charred corn has been reported by any accurate investigator, and small coals may have been mistaken for this. Very little pottery has anywhere been found, but charcoal and burnt stone appear in all. In French's *Gazetteer* it is said that " in the vicinity of Perch Lake have been found several barrows, or sepulchral mounds." *French,* p. 360. It would not have been surprising if some of the larger ones had had a secondary use for burial, being well adapted for it in such a region, but no evidence of this has yet been found.

Regarding these Mr J. S. Twining wrote me in 1886 of a more extensive distribution of these mounds than has been given by others. He said:

> We have extensive vestiges of a much older race than those who built the forts and made the pottery. They are scattered along Black river, some 6 miles from Copenhagen, and also on the hills back of Perch lake, some 10 miles from Watertown, on the farms of John Gailey and A. Klock. On the latter are the largest and most perfect. They are the remains of camp bottoms, with a depression in the middle, with a true circle of camp refuse and burnt stones around them from 2 to 5 feet high, and with a diameter of from 20 to 30 feet. I have never found a piece of pottery in any of them, but plenty of flint chips. *Beauchamp,* p.113

Mr D. S. Marvin made a day's exploration of the Perch lake mounds in August 1886 in company with Messrs Carter, Woodworth and Woodard. The results he embodied in a paper read before the Jefferson County Historical Society, Mar. 15, 1887, adding a few facts from the earlier explorations of Henry Woodworth and J. S. Twining. The lake is a small one, part of the shores high and rocky, but much more low and marshy. The mounds occur only on the higher part. The outlet is 6 miles long, and mounds have been reported near this. At the natural bridge, near its mouth, are extensive camp sites with abundant bone articles and fragmentary pottery. The most important part of Mr Marvin's paper is quoted here as follows:

The objects that arrest our attention and interest us the most are the so called Indian mounds, observed along both shores of the lake, and more or less down the outlet. They are situated upon the bluffs overlooking the water, and reach back from the lake sometimes a hundred rods; they number some two hundred in all. These so called mounds are all round, usually from 50 to 90 feet in circumference; some of them double, and so near that their edges coalesce. They are elevated or raised above the summits of the hills they occupy from 2 to 4 feet. Where the land has not been cleared, ordinary forest trees of all ages are seen growing around and upon the mounds, ranging from yearling growths to trees several hundred years old. The debris usually observed about old Indian villages is found buried in the soil, old bones and broken pottery; the organic remains though seem to have mainly rotted and gone to decay. The broken pottery observed was of the usual patterns, but it is only sparingly observed, for around some of the mounds none could be found. A few of the small mounds were flat topped, but the usual shape and appearance is a ring of earth, with a depressed or basin-shaped center.

In opening cross sections, or digging trenches from the outside to the center of the circles, as the centers are approached, remains of fires, charcoal, ashes, etc., were observed, sparingly though in the case of the largest mound. There was observed no disturbance of the soil below the level of the natural surface. The dirt of which the mounds had been constructed, is the common country soil, none of it seemingly brought from a distance, similar in character and composition to the soil of the adjacent land, made up of clay, sand and small fragments of the underlying limestone, belonging to the Trenton group, as near as I could determine from a cursory examination of the contained fossils, with here and there an occasional

transported or drift pebble. The only observable difference was a darker color, caused by an increase of decayed organic matter and burned earth. No graves or human bones were observed. No lines of entrenchments were to be seen. Nor have there been any metal objects or utensils found.

The explanation of the phenomena observed here, that has seemingly puzzled several generations of white men, seems to be plain and simple. There is no necessity for bringing farfetched theories to explain the observed facts. Whoever has been to California and noted the singular rings of earth, with their basin-shaped centers, that are known to be the remains of the old rancherias of the Digger Indians, can readily see here in the close resemblances the original forms of Indian houses, belonging to the lower stages of barbarism, and probably a more or less universal style of house belonging to this stage of advancement, usually occupied only during the winter months, or generally deserted for nomad life during the warmer summer months. This style of house was constructed with a framework of poles set upon end and meeting at the top, and covered with dirt, leaving an uncovered space at the top to serve for the exit of smoke.

The writer once visited one of these dirt houses in California, large enough to hold several hundred people, but perhaps not larger than the remains of one of those observed at Perch lake. Professor Thomas has described the remains of similarly constructed houses in Mississippi, Alabama and Georgia. . . . I have also observed near Burrville, within a strongly fortified enclosure, circles of toadstools that had grown up from organic matters, old bones, etc., buried in the soil, showing that similar round houses once existed within fortified enclosures, but unfortunately both ditches and circles are now leveled by the plow. *Marvin,* p.58

I add some notes sent me in October 1901 by Mr Henry Woodworth, one of the party mentioned, but whose conclusions are different. Both these gentlemen are careful observers:

I visited the mounds with Mr Marvin and Clarence Woodard, and we spent one day at the lower end of the lake, on the south side. We found a very large mound on a ridge in the woods. Some large maple trees were in it. Distance from the lake was 10 or 15 rods. We did the most of our digging in that one, but we dug in others that were hollowed on top, as most of them are. We found but little to pay us for our labor. The ashes and coal that would naturally accumulate were very light. For that reason I think they were occupied only for a short time in the summer, for fishing and hunting. If they had been used to winter in, the accumulation would have been much more. I and my son dug some in the mounds on the Gailey

farm at another time, but we found nothing to satisfy our curiosity. No shells were found in any of them by any one. We found no flint in any mounds. Mr Gailey said some had been found, and stone pipes, but who has them I do not know. He says but little was ever found. I found no bone articles. We found some animal bones, but they were so decomposed that they easily crumbled to pieces. About the outlet and lower end of the lake are a number of mounds on the Gailey farm, of different sizes. Some are flat on top, but most have a depression in the center. Mr Gailey said there are over 200 up the creek and around the lake. I think there are mounds below Mr Gailey's, but I never visited the upper end of the lake.

He said there was no accumulation of burned stones in the mounds, probably meaning the small ones used in heating water. From this and the lack of pottery he concluded that no cooking, or but little, was done in them. Most of the many stones found show the action of fire, but they are usually of some size.

In a letter dated Aug. 4, 1900, Dr Getman said:

We were at Perch lake a few days ago, and examined the mounds that are found at each end of the lake. We were at the north end and along the banks of Hyde creek. They are situated near the bank of the lake, extending upwards on to a high bluff of sandstone, and gravel of the same, along the banks of Hyde creek. They are 25 to 30 feet across, 3 to 5 feet high, with a central depression of 8 to 10 feet in diameter. This depression is paved with the usual firestones. We saw one that was on a gravel bed, and had been partly removed. It was uniform in thickness, simply burned sandstone, gravel and black earth. The earth is different from the surrounding soil, being burned. We saw no pottery, bone, or anything that would give us a clue to the builders. Hough says broken pottery and bones are found there. This I think a mistake. Some have been dug to the center, and we were informed they had found flint and stone implements. There was only one that showed evidence of large timber growing from the site. We counted 15 in a piece of woods, and the trees (maple) were mostly small that were growing on the banks.

In a recent history of Jefferson county the mounds at the north end of the lake are again mentioned, but with little additional information save that of partial location. The editor says that at the lake 8 or 10 mounds are on the lands of George W. Sherman and Alonzo Van DeWalker 10 or 15 rods from the shore. They are circular, 2 or 3 feet high, 2 to 4 rods in diameter, and with the central holes 2 feet deep. The largest is said to be on the Sherman farm, near the ruins of the old La Farge mansion. *Emerson*, p.738

There are two large groups north of any of these, and but one mound was observed by me over 40 feet in diameter. The fine pair in front of the old mansion are by no means of the largest size, either in hight or width.

Before adding notes of personal observations to these, it may be well to take notice of some kindred groups on the north shore of Lake Ontario, which I had planned to examine some years since. Mr Thomas C. Wallbridge read a paper "On some Ancient Mounds upon the Shores of the Bay of Quinté," Mar. 3, 1860, which was printed in the *Canadian Journal* for September of that year. These mounds had then been locally known as artificial for 50 years, but no account had been previously published. Commencing at Rednersville they could be traced along the bay about 8 miles to Massassaga point. This space, with the islands of Big bay, included about 100 distinct mounds, but others could be seen at intervals from the eastern to the western end of the Bay of Quinté. Others were reported at one place on the River Trent. Mr Wallbridge said:

As far as has yet been ascertained, there is but one class or form of mounds in this part of the country, and the truncated cone is the shape they assume. In size they vary from a diameter at the base of 30 to 50 feet, to a diameter at the apex of 12 feet. Each mound has a shallow basin or circular depression upon its summit, which, whatever be the size of the work, has a diameter of 8 feet; and no mound under my observation possessed an altitude of more than 5 feet. It is a remarkable peculiarity of these works, that in almost every instance they occur in groups of two, and at irregular distances the one group from the other. Irregularity is likewise observable between any one mound and its fellow, these being sometimes found in juxtaposition, and again from 50 to 100 feet asunder. The two of the same group are always of one size. With respect to the surrounding country they are situate apparently without design, now at the foot of a commanding hill, then halfway down the side of a bank, and again so near the shore that in several instances they have been destroyed by the action of the water. Twice they have been found in very low or swampy ground, and in those cases they occur singly. *Wallbridge,* p.111

He opened five of these at Massassaga point in August 1859. A cut was made 33 feet long, 2 feet wide and 3 feet deep, to the original surface. Under a few inches of mold was a heap of broken gneiss,

conforming to the outer shape of the mound. The stones varied from 1 to 20 pounds each, but those forming the bottom of the basin were the smallest of all. Some showed the action of fire, but there were no traces of this in the mound. In making a cross-section some fragments of birch bark and bone were found above the stones. He said:

The other mounds examined agreed in all particulars of construction with that above described, excepting in one pair where it was evident from what remained that the inside margin of the basin of each mound had been surrounded with flat stones placed vertically and touching at their edges, as if designed to prevent the earth falling into the hollow. Similar stones, perhaps used for the same purpose, were observed lying near most of the other mounds in this vicinity.

He thought these had been displaced by diggers, and added:

In several instances the builders have been forced, from the nature of the surrounding country, to carry their material from a distance, but to obtain the usual covering of mold for the pair of mounds last mentioned they have bared the smooth underlying rock of its scanty soil, in a well defined circle about the works. The use of broken gneiss for a building material, to the almost entire exclusion of limestone, is a noticeable feature.

Limestone was most easily procured, but I think its change by fire may have made it objectionable. Large trees grew on some mounds, one oak stump being 8 feet around.

So far the likeness to the Perch lake mounds is that of external form, size and situation, with a tendency to pairs. The interior differs in the character and arrangement of the stones, and the absence of coals. Similar ones were examined later, but one was of a sepulchral nature. This was excavated from the center to the natural surface. Some of the diagrams made are here partially reproduced.

Plate 10, figure 3, shows a section of the mound in which skeletons were found, with general features of the construction of all. In this appear the interior stones, the overlying soil and the central depression. Figure 2 shows the position of some articles found, and the central chamber. Ground was broken at 10, and a little below the surface was a flat, horizontal limestone, with fragments of human

bones and birch bark, and a bone awl 8 inches long. These were probably from intrusive burial.

Another flat stone was found 2 feet from the surface, with three human skulls underneath, in a rude box of flat limestones. Many of the remaining bones were found, and five well preserved crania were secured. One skeleton at 6 was in a sitting position, with a pile of articles by it. Among these was the upper part of a bone comb, several teeth of the same, a unilateral bone harpoon, and three long shell beads. These articles do not indicate a high antiquity, and are much like those of New York. The burial was clearly intrusive.

A sketch of this interesting group has been given because it is little known, and partly because, being not far distant and in a very similar situation, it may have some relation to those of Perch lake. The latter seem to have gradually increased in hight; according to Mr Wallbridge the former would seem to have been of nearly the same size from the beginning. This hardly seems probable, nor is it likely no fire was used in them, judging from what is found elsewhere. I saw no ashes in those of Perch lake, and in some cases the coals were so blended with the soil as to be hardly distinguishable.

In the spring of 1901 I visited Perch lake, where the old La Farge mansion once stood, at a considerable distance north of a large stream which enters the lake on the east side. Quite a point extends into the lake near this, back of which is a rocky bank, and thence the land rises eastward in low and broad terraces. On the greensward of one of these, not far from the bank, two of these mounds are conspicuous, one being a little above the other, and the edges meeting. At this spot they are the only ones in sight, and both have the characteristic circular form and depressed center. A little digging has been done in each, but this has affected the appearance very little. Though a little shaded they are practically in open ground. They are not of the largest size. The upper and eastern one has an extreme breadth of 34 feet, and an inside diameter of 14 feet from the interior slope. This is about 2 feet deep, within and without. The western one is of the same outside hight, and is 32 feet across the base. The inside width is 17 feet, and the depth

3 feet. Some digging has been done in the center. The disturbed earth is black, containing burnt stones, but there are no signs of organic or artificial remains. Not far away there are many spots where the flat rocks form the natural surface, and about these the spring saxifrage was abundantly in bloom. The low, symmetric mounds themselves formed a pleasing feature of the scene, full in view from the modern ruins as the land descended toward the lake. The spot is so convenient and beautiful that one might have expected to find more there, but for the evident tendency to place them in pairs or small groups.

It was late in the morning, and no satisfactory photographs could be obtained from lack of shadows. At a subsequent visit many mounds were examined in the rain, and others in the depths of woods and undergrowth. Many sketches were made, some of which are here given, but in no place could the camera be used to any great advantage.

A second visit was made in the middle of September 1901. A map of the vicinity had been secured, on a scale of a mile to the inch, and the general grouping will appear on this, shown on plate 1. As there was no special plan in the location of these structures, no necessity is felt for more exact details. They were placed where personal or family taste or convenience required. No rule appears in this except ease of access to the lake or streams. Some were on quite elevated land; others on broad hummocks, surrounded by marshy spots but little above the lake. In a few cases they were on the high banks above rocky streams, at some distance from the shore. The unpropitious weather prevented a personal examination of those at the south end.

As far as I could ascertain there are none now remaining on the west side of Hyde creek and northwest side of Perch lake. The lake may once have been higher than now and thus larger, but this did not affect the situation of the mounds, nor their probable age. Beginning on the west side of Hyde creek a long line of cliffs runs parallel with the present shore toward the southwest, and between these and the lake is a broad expanse of swampy land, well covered with trees. No one could have lived in this swamp, nor was access

to the shore through it in the least easy. I examined the undisturbed land at the top of these cliffs for a long distance, without finding a trace of aboriginal life. Every favorable indication was carefully examined, but nothing appeared. There may have been obliterated dwellings in the cultivated land farther back, but this is not probable. The swamp was an undesirable barrier to the lake.

Farther north, on the west side of Hyde creek, the case was different. That stream came fairly near the rocky uplands, affording an easy passage to the lake. Accordingly a few mounds were reported there, though none seem to remain. Certainly they were few. I was told of two mounds leveled by my informant on the A. J. Dillenbeck farm in 1901. These were 5 rods west of the swamp and 30 rods from the lake. In plowing there he found a broken flint knife, a fragment of pottery and a pottery rim, all of which he gave me. From the character of the rim I think there is an error of location. These were all the mounds of which I could learn on that side.

Mr S. Getman said that he found a celt near two mounds he plowed up on the south part of his farm, at an early day, on the higher terrace east of the creek. I found no existing mounds as far north as this. A celt and arrowheads were reported from two mounds destroyed in 1900, on the upper terrace of the Timmerman farm. These had disappeared. The dual arrangement may be observed in all these mounds. It is probable that many mounds have long disappeared from this higher cultivated land. Those remaining are on the stony lower terraces. Commencing south of the Getman farm they extend along the shore to a stream called Ruff's creek by some. South of this swampy lands again appear by the lake. This eastern shore is mostly high and rocky, rising thence in terraces, and the mounds appear here and there all the way. Some mounds may have escaped my attention in the undergrowth on the Van de Walker farms.

A medium sized mound was opened on the farm next south of S. Getman's. Plate 4 shows this, on the second terrace east of Hyde creek and not far from it. It is 30 feet across and 2 feet high, with a broad central depression. A rectangular fireplace in the

center was 8 feet across and edged with upright flat stones. This went down 2 feet below the present surface, the earth having been removed for the fireplace, and cast back as a foundation for the ring. Plate 12, figure 2, shows the surface plan. A is the outer slope, B the top of the ridge, C the inside slope, D the fireplace edged with stones, which is not an invariable feature. There were many coals in the black earth, no ashes and no vestige of anything else. There were many large stones. A trench was carried through to the original surface, and shorter cross-sections were made. A little southeast was another of similar size, rather flat and not prominent.

Another, farther south, is near the north line of the Timmerman farm. This is about 36 feet across and 2 feet high. It is flatter than most on top, but shows the usual depression. Small trees are growing on it, and there are some large stones along the edge. They may have been dug out of it, for most mounds have a few such stones. Plate 5 shows this.

A mound on the Timmerman farm has a large hemlock stump on it, and some small trees. It is a continuation of a low ridge, so that its exact dimensions are modified by this. As measured it is 28 feet wide by 2 feet high. The hemlock stump might show how old it must be, but not how old it might be. In these descriptions the general course is from north to south. A low ring, 19 feet across and on the same farm, tends to show that growth in hight and width was slow, and by removals of matter from center to circumference; possibly by additions without. The depression is 8 feet across, but it was not noticed whether there was an inclosed fireplace. Plate 6 is of this. Another, west of the fence and this, is broad and low. Still another small one is on the lower terrace, not far away. Both these are northwest of the next.

A high mound on the edge of the upper terrace, and just west of the fence which crosses it, was not measured across, but is 3 feet high and with a deep central depression. A large stump is on the south side of this. Part of its effect is lost from its surroundings. There is an obscure one on the lower terrace a little west. Another low one with a wide and deep depression is on the same farm, and is shown in plate 7. It is about 21 feet wide, the hight being usually

in proportion to the width, and is an excellent example in its symmetry.

On the same farm is another 27 feet wide and 2 feet high, having a deep depression. A small one is just west of this, and perhaps related.

Another is 30 feet wide and 2 feet high, having a depression. There are some large stones outside of this. As the mound rose and the ring grew, it may have taken in loose boulders around, which had no relation to it. There is an obscure one north of this, and near a shanty in the woods. One on the south side of the shanty was 2 feet high.

A gravel bed, which has been opened in the woods, was cut through one of these mounds, in such a way as to give a good exposure. The bed reached above the mound on the east or upper side, the mound terminating a ridge, and nothing is seen in the exposure there. Another cut has been made in the mound below. At the base is coarse gravel, in its natural condition. Over this is a stratum of black earth, 3 feet deep and about 27 feet wide. The top and the extremities of the mound remain. Nothing was found in obtaining the gravel, nor was anything discovered in our farther digging. Not far from this, by the fence on the upper terrace, was another large one.

The finest mound on the Timmerman farm is near its southwest corner, in an open field and near the head of Perch lake. It is 33 feet wide and about 5 feet high. Plate 8 is of this. It is at the foot of a bold hillside, and itself on high ground. Digging had been done there, and the Rev. Mr Scott is said to have obtained pottery and other things in 1901. We dug but little, and found nothing. Other low mounds were near toward the lake, and there is a large flat one quite a distance north. South of this group is low land for some distance, crossed by a rapid stream.

Leaving this stream and the low land the woods on the Sayles farm are reached, where there are many evergreens and a rocky shore along the lake. In these dark woods are other mounds. One is near the north end, and has its east side more elevated than the other, apparently from the slope of the land. This has quite a deep

depression, and is of the usual size. A low and broad one is north of this, and two smaller ones south. Another large one is farther southwest. The depression is deep.

South of these woods is lower land and a brook, both north of the large point. A fine mound is on a low bluff in this bay. There are several mounds not far off. One is on the low bank near the shore; another south of this on a knoll or slightly higher land. Another, beyond the last and on the lake side of a knoll, has a very deep and large depression, 13 feet across. There is another at the south end of this ridge, and another in the low land east. Two are on the lower bank farther south, and there is a confluent group at the north base of the high terrace on which the La Farge mansion stood. The situation of these in these low lands is singular, though some of them are dry enough, and the spot is unusually sheltered.

South of the brook, as the large point is turned, there appear deep depressions and slight rings of an undecided character, and then come the two fine mounds in front of the ruined La Farge mansion, already described. Plate 9 shows the upper and larger one. South of this is low land, through which a large stream enters the lake. Beyond this creek no mounds appear for nearly half a mile, though some have probably been destroyed. Then one with a deep and broad depression appeared on a high bluff in the edge of the woods. It was about 27 feet across. High rocks here fringed the lake, with terraces above, on which was much undergrowth.

Nearly a quarter of a mile beyond was a doubtful one, not having a complete circle, and a similar one was on the edge of a knoll beyond. It is difficult to estimate distances while looking for mounds in thick woods, and it may be another quarter of a mile to a large and fine one on the second terrace. This was 27 feet wide, 2 feet high, and has a depression of 3 feet in the center. As before observed, it was usual to dig out the center in beginning these mounds. Not far away are two large ones, close together on the high bluff above the lake. Another just beyond is 36 feet wide, and the depression is 16 feet across. Another obscure one is farther south near the high bank of the lake. Between this and the cottages and boathouses beyond, is one 36 feet wide, 3 feet deep inside, and 2 feet outside. This is fine.

A stream enters the lake at the boathouses. South of this and east of the shore is a large and high mound in which digging has been done. In the freshly turned earth no vestiges of early occupation could be seen except black earth and burnt stone. This mound is about 5 feet high and 40 feet across. Common pottery was found in small camps by the shore. Beyond this is another low mound. Probably some in these woods were not observed.

After leaving the woodland the swamp is soon reached, and some mounds may have been obliterated in the open fields. North of the swamp flows a small rocky stream through these fields. On the brow of the upper terrace, on the north side of this is the largest and deepest mound I saw, measuring 45 feet across. Another is close beside this on the east, and another on higher ground still, in the rear of these and toward the road. On the south side of the stream, farther down and overlooking the water from a high bank, is another small but deep one under a tree. It is a pretty situation.

A large mound is near a shanty in the sugar camp, toward Ruff's creek. This is 40 feet across and 3 feet high. A good deal of digging has been done there, but seemingly without results. A smaller one is near the shanty. This ended the explorations on that side of the lake. The oldest inhabitant knew of nothing taken from mounds south of the La Farge mansion. In all 54 mounds were observed, and 6 obliterated ones reported, or 60 in all. Other unobserved or obliterated mounds might much increase this number, but it is not likely to reach the higher estimates made for the whole territory.

At the north end of the lake is one spot deserving of a few words, and yet probably not connected with the general subject. In the edge of the swamp at the northeast angle of the lake, is an immense mass of rock which can be reached by a boat. In some of the depressions of this rock are many small flint chips, showing that it was a favorite spot for arrow makers. What weapons the makers of these mounds used is uncertain, but it is probable that the visitors to Squaw island, as some call it, were of another people. The spot commands a view of nearly the entire lake.

Dr A. A. Getman and Oren Pomeroy, of Chaumont, kindly made a close examination of the group I could not visit and with much the

same results. Both are experienced and careful observers, and for this reason I give Dr Getman's account, written Nov. 6, 1901. He wrote:

We went to Linnell island today. It is a limestone terrace, surrounded by lowland and swamp. . . Mr Gailey says the island contains about 500 acres, with three farms at present. The soil is clay and a gravelly loam, with abundant outcroppings of rock (Chazy limestone). From the map you see the mounds dot the crest of the terrace all around the island; some at least ¾ of a mile apart. Some of them appear to be built on the rock. In fact we dug the center of one down to see that it was *started* on the solid rock. We dug on this one near the barn. It had no central depression. We dug the center to the bottom; pit 4 feet square; then commenced at the edge on the south, and opened to this pit. There are less stones and more soil than at the head of the lake, but we found lots of large hard heads, 8 to 12 inches across, about halfway from the edge to the center. All were burned. The depth was 2 to 4 feet from circumference to center. There were streaks of very dark earth and charcoal. Some of the charcoal was small limbs, 2 to 4 inches long, by 1 inch through. Three of the mounds have been removed for road building. They appear to make excellent roads. (These are marked A, A on the map, plate 2.) We saw some recent plowing which exposed three more. They were near those removed.

We looked over the three that had been used for roads. They had been only partially removed. The manner of working had been to plow the soil loose and shovel on the wagons; three men to *beam* the plow. In the plowed field some were smoothly plowed; on others the plow ran out. We found in the one near the house of J. Gailey, marked S, a skull and teeth of a muskrat, badly decayed, and a piece of broken stone that looked as if used for a nut stone. That is absolutely everything, except burned stones of all descriptions, charcoal and dirt; unless a few pieces of reddish crumbly pieces of stones were paint stones. S also shows some excavated mounds.

We looked over the plowed field, pawed over debris of the *road* mounds, and looked over the road that the stones were used on—a private road to the Klock farm.

How many mounds there are I have no idea. We counted about 20, but there have been and are many more. I think, as a general thing, that they are smaller than those at the head of the lake, and of less depth. Mr Clarence Gailey claimed to have found two arrows when working the road business, but could not produce the find. It is very perplexing that no authentic relics can be found and handled. Pomeroy says the mounds are similar to the one we saw on Fox island: that is the contents, stone, soil, etc.

Mr R. D. Loveland, of Watertown, found a few small fragments of pottery in the large mound near the boathouse, but did not preserve them, as he obtained larger pieces of the usual types near the shore, where these might be expected. Had none been found elsewhere those in the mound might be thought intrusive. A clay pipe was also found near the shore.

In the *Bulletin of Natural History of New Brunswick* for 1884, p.14, Mr G. F. Mayhew gives his ideas of how such hut rings were gradually raised. I infer that these might have been well known there, but am not certain on this point. He supposed that in some circular lodges moderate cleanliness was preserved, not by removing refuse altogether, but by drawing it back and filling in the center with fresh gravel. A constant repetition of this would preserve the circular form and the central depression as the mound rose above the surface. Bone needles found near the edge he thought had been stowed at the back of a couch. Pottery was much like that found elsewhere. Arrowheads were made by the fire, few flakes being seen out of doors. Most ordinary aboriginal implements were found.

This general mode of elevation reasonably accounts for the form and growth of the Perch lake mounds. A pit was made in the center for the fire, and a large circle was thrown up at the edge of the lodge to carry off water. A slope from this to the fireplace gave an easy position to the reclining people within. It was necessary to remove or rake the embers away, and the edge gradually rose. To make it cleaner it was as easy to bring in a fresh supply of dirt as to carry accumulations away. In all this there was a natural overflow which enlarged the borders of the mound. The original fireplace was all the time retained, and so the largest mounds are the deepest.

Mr Harlan I. Smith suggests a likeness in these to some he recently examined on the Pacific coast, and I give plate 10, figure 1, to illustrate this point. In his explorations he found that up to a recent date the Thompson river Indians made huts of this kind. In this section *a* is an excavation in the ground, which increased the hight of the interior of the lodge, and supplied material for its covering. Around this excavation an arch *b* was raised, resting on the surface

c. This arch had a frame of saplings and branches underneath, covered with dirt and sods. In the center of this strong frame above an opening, *d,* was left. This was reached by a primitive ladder, *e,* made of a notched pole which gave strength to the roof. This was the only means of ingress or egress for light, smoke and Indians. He found one still standing in a dilapidated condition, but observed the remains of many. When the roof fell in, a low mound was formed, with a marked central depression. These would probably differ from the Perch lake mounds in the size of this depression, the hight of the circle, and the evidences of fire throughout. The latter were probably simple tepees, pitched from time to time on the same spot, but not continuously occupied. The accumulation was gradual, but earth might have covered the lower part of the wall.

In his report on *Mound Explorations,* Prof. Cyrus Thomas described some mounds of this class closely connected with larger mounds in the Welch group, Brown county, Illinois. The group "consists of six mounds, and a number of small saucer-shaped basins surrounded by low, earthen ridges, doubtless the sites of ancient dwellings or wigwams." *Thomas,* p.118. He adds that "the dwelling sites vary considerably in size, some being as much as 70 feet in diameter, and some of them 3 feet deep in the center after 50 years of cultivation." In describing those on the Big Mary river, Ill., he adds something on their situation and origin:

> These are situated upon a flat topped ridge, about 30 feet higher than the creek bottoms. They are low, with the usual depression in the center, but the outlines are rather indistinct. Mr Gault of Sparta, who has long resided here, states that when he first moved to this section, the Indians lived in houses or wigwams which, when decayed, left such remains as these. They hollowed out a shallow circular cavity in the surface soil, then, standing poles around the margin of this basin, brought them together at the top, and having covered them with bark or other material—in other words having constructed wigwams of the usual circular form—covered them in whole or in part, specially the lower portion—with earth. He also said that after a camp was abandoned and the wood rotted away, it left these rings of earth. *Thomas,* p.141

In one inclosure near Lakeville, Stoddard county, Missouri, he says,

Nearly the whole space between the walls is occupied by the hut rings or circular depressions. They are of the usual size, 20 to 50 feet across, and 1 to 3 feet deep. *Thomas,* p.174

These contained ashes, pottery, etc., and he mentions no ridges. In another group the rings varied from 21 to 34 feet across. In another large group we get a more definite idea of the elevation, a feature in which most of these seem to differ from those of Perch lake. This is at Beckwith's fort, Mississippi county, Missouri. After describing the inclosure he says of the hut rings:

These almost cover the remainder of the area, the only open space of any considerable size being the 200 feet square just east of the large mound. They are not confined to the natural level of the inclosure, as some are found on the level tops of the mounds. They are circular in form, varying from 30 to 50 feet in diameter, measuring to the tops of their rims, which are raised slightly above the natural level. The depth of the depression at the center is from 2 to 3 feet. Near the center, somewhat covered with earth, are usually found the baked earth, charcoal, and ashes of ancient fires, and around these and beneath the rims split bones and fresh-water shells. Often mingled with this refuse material are rude stone implements and fragments of pottery. The similarity in the size, form, and general appearance of these depressions and earthen rings to those of the earth lodges of the abandoned Mandan towns along the Missouri river, leaves no doubt that they mark the dwelling sites of the people who formerly occupied this locality. *Thomas,* p.187

These mere depressions illustrate but one feature of the Perch lake mounds, and we have a closer correspondence in those described by Prof. F. W. Putnam in the 11th report of the Peabody Museum, and quoted by Mr Thomas. They were some observed by the former in Tennessee, and thus described:

Scattered irregularly within the inclosure [the earthen wall which inclosed the area] are nearly one hundred more or less defined circular ridges of earth, which are from a few inches to a little over 3 feet in hight, and of diameters varying from 10 to 50 feet. . . An examination of these numerous low mounds, or rather earth rings, as there could generally be traced a central depression, soon convinced me that I had before me the remains of the dwellings of the people who had erected the large mound, made the earthen embankment, buried their dead in the stone graves, and lived in this fortified town. *Thomas,* p.662

Professor Thomas adds that these hut rings "are seldom, if ever, met with except on the site of an ancient village, and often one that was defended by an inclosure." This again differentiates the western and southern forms from those of New York. The latter are scattered or in very small groups, have the depressed center very little below the natural surface, are usually of considerable hight, show the action of fire, but rarely contain ashes or relics of any kind, have no bones or shells, and the earth of which they are composed has been gradually gathered from year to year. With all this difference there is an unmistakable likeness, and no hesitation is felt in calling them the foundations of early lodges.

Two things naturally arrest attention. There are no bones or shells revealing the food of the inhabitants, though the conditions are favorable for their preservation. Most of them contain no articles made by man. The favorite fresh-water clam of the New York Indians was Unio complanatus. It is so widely distributed that it probably occurs in Perch lake, though I observed none along the shores. If it is not found there that part of the problem is solved. But these aborigines were there for the fish of the lake, as well as for the game in the woods. Their homes had an easy access to the water. Why are no bones of any kind found under these conditions? The Iroquois sites yield them abundantly. It may be due to an Algonquin superstition. All will agree that these were not Iroquois homes, for they rarely used the circular lodge, which the Algonquins commonly preferred. There were differing tastes and beliefs of other kinds. The Iroquois left bones of every description on the ground. The Algonquin scrupulously gathered up many kinds, and either threw them in the water, or burned them in the fire.

A single quotation from the Relation of 1634 will illustrate this. The missionary said:

> The savages do not throw the bones of the beaver to the dogs, or of female porcupines, at least certain special bones; in short they very carefully take pains that the dogs shall eat no bone of birds or other animals which are taken in a snare. Otherwise they will take no more except with the greatest difficulty; besides there are within a thousand observations, for it is important only that the

vertebrae or the rump alone should be given to these dogs, the rest must be thrown into the fire; still, for a beaver taken in a snare it is better to throw his bones into a river; it is a strange thing that they gather and pick up these things, and preserve them with so much care that you would say their hunt had been lost had they gone contrary to their superstitions. As I ridiculed them and told them that the beavers did not know what was done with their bones, they replied to me: You do not know how to take beavers, and you wish to talk about them; before the beaver is entirely dead, they said to me, his soul comes around by the cabin of the one who killed him, and notices carefully what they do with his bones; that if one gave them to the dogs the other beavers would be warned of it; that is why they would render themselves hard to catch: but they are very glad if they throw their bones into the fire or into a river, the snare especially, which has taken them, is well pleased. I told them that the Iroquois, as is done among us, threw the bones of the beaver to the dogs, and yet they very often took some, and that our French, beyond comparison, were accustomed to take more game than they, and yet our dogs were accustomed to eat the bones.

The Algonquins, of that day, extended this rule to fish, and it may have had wider applications still. To leave no permanent memorial it was necessary only to care for the bones on the lodge site. Outside of the circle they would soon perish, and this superstition prevented their casting them there. These lodges had no dumping places; everything was disposed of on the spot.

In referring these mounds to the Algonquin family another fact is explained. These nations may not have been without earthenware, and perhaps most of them were not, in a limited way, but it was not so common as with the Iroquois and others. They were nomadic, and the lightest vessel possible suited them best. It was particularly necessary to have one not easily broken, and that could be readily replaced on a journey. Toward and north of the St Lawrence the canoe birch abounded, and of this material their cooking vessels were formed. Their cooking was not very thorough, and hot stones, dropped into the water, heated it enough for their needs.

Why arrowheads are not found, nor other stone implements as a rule, is a more difficult question, but capable of various answers. There were careful aborigines, those who lost little, as well as those careless and wasteful. Articles were not so readily lost, but more

readily found, in a cabin than in a village. The wooden arrow might have sufficed for most of the needs of the place. Some have suggested that the huts were those of a recent day, and that no purely Indian relics may be expected. I do not assent to this view, nor am I prepared to say with Mr Marvin, that these forest men have left us traces of the oldest habitations in the State. The fact seems to be, however, that we must make these very modern, with but little to sustain this view, or place them before the Iroquois occupancy of New York and the St Lawrence. Till the Iroquois sold their lands there has been no time within the last 300 years when it would have been safe for Algonquins to have habitations on Perch lake. For a century before that, at least, Jefferson county was occupied by the Iroquoian family, and they had no wish for intruders. How much these mounds antedate the last four centuries is a harder problem. I think they may safely be placed within the past 500 years. Traditionally the Algonquin and Iroquois family arrived here nearly together, and at no remote period. An examination of the sites of their camps and towns seems to substantiate this, and these mounds suggest a period antedating that of their inveterate hostility. They were undefended, long used, and yet were in a territory claimed and held by the Iroquois for hundreds of years.

Two maps of the vicinity are given; one from a large county map, and the other from the public topographic survey, conspicuously differing in some respects. In the latter, plate 3, the lake is much shorter than in the former, and streams which enter the river in one flow into the lake in the other. The difference may be accounted for by the fact that part of the swampy shores were once included in the lake, when the water supply was greater. On the former map the general range of the mounds is indicated by the usual sign.

OTHER NEW YORK MOUNDS

A few supplementary remarks may be made on other mounds in New York, the larger part of the State having none, and most of those found being of small size and simple character. In some cases natural formations have been mistaken for these, having been

used for burial or camps. In 27 counties some form of mound has been reported and a summary of these follows. They are most frequent west of the center of the State, and will be mentioned by counties.

Several occurred in Allegany county, and thence westward they were frequent. In the town of Conewango, Cattaraugus county, was a tumulus 13 feet high, with a diameter of 61 by 65 feet. Skeletons were found with relics. In the village of Randolph was a burial mound 10 feet high and 35 feet in diameter. In the town of Bucktooth, north side of the Allegheny, was a burial mound, 39 feet in diameter and 10 feet high. Another was in the town of Napoli, on Cold Spring creek, which was 120 feet around. At Olean were several of these, one being 40 by 60 feet in diameter and nearly 10 feet high. One in Dayton was of the same hight, and 120 feet in circumference. Another was on the west side of the Allegheny river, in the town of Cold Spring. This has been reported as 200 feet around and 20 feet high; probably an exaggeration. On Cold Spring creek, 2 miles from the Allegheny, were two burial mounds, 10 feet high and 100 feet around. Others were in the towns of Leon and Conewango, in one of which were 8 sitting skeletons.

Quite a number were in Chautauqua county. One at Cassadaga lake was 7 feet high and 30 feet in diameter. A stone mound near a fort in Ellington was 4 feet wide and 5 feet high. Two mounds near Griffith's point, Chautauqua lake, were once 12 feet high and 40 feet in diameter. A number of similar mounds have been reported on both shores, and two near Jamestown. Another, near Rutledge, was 20 feet in diameter and 6 feet high. One in the village of Fredonia was 7 feet high. Another at Fluvanna seems recent. Most mounds west of Cayuga lake were sepulchral.

Near Spring Lake, in Cayuga county, were small mounds with human remains, but these may have been incidental, as in some other places. On the high land of Howland island, near the river, are one or two suggestive of Perch lake. One is not very distinct, but the other stands out plainly. It is a circle with a diameter of 37 feet and an elevation of 30 inches, inclosing burnt earth and

stone, but yielding no relics. The earth is in its natural condition for a considerable distance around. Some pits within the circle may be the work of explorers. This I examined July 18, 1902.

The noted burial mound in Greene, Chenango county, was 40 feet in diameter and 6 feet high. Several hut rings have been reported along the Chenango river, similar to those at Perch lake, but those at Indian brook, a little south of Greene, prove to be caches.

Columbia and Schoharie counties both had the stone heaps to which Indians added stones in passing.

Erie county had its full share of mounds. One at the mouth of Cattaraugus creek was used for burial, but was probably natural. It was 50 feet across and from 10 to 15 feet high. The relics were modern.

There were several burial mounds on the east side of Cattaraugus creek, two of which were excavated by Dr A. L. Benedict of Buffalo, in 1900. As good accounts of such work by competent observers are rare in New York, his plans are given in plate 11, and his report is summarized from the *American Antiquarian* for 1901, p.99–107.

No. 1, a truncated mound in an open field when I saw it, is a mile north of the creek, and 600 feet north of the high bank of the ancient valley. It is nearly circular and about 70 feet in diameter. The central hight is 4 feet, 8 inches, but he thought it was originally 10 or 11 feet high. It was made of sand loam, and there were depressions north and south in the general level of the field. It had been disturbed. At A were animal bones, ashes and charcoal at 3 feet, 5 inches from the surface; also bones of the aboriginal dog. At B was a heap of flat pieces of Hamilton slates, some of them waterworn. A rib and sacrum under these he thought those of the musk ox. At C was a fragmentary human skull, with other human bones, at a depth of 3 feet. Near this were flint arrows and knife, flint chips occurring elsewhere in the mound. Dr Benedict's plans have the top to the south.

No. 2 resembles the last and has been reduced by plowing. It is quite near the creek, and a central shaft was sunk below the original soil in 1875 by William C. Bryant of Buffalo. Gravel was found

4 feet below the level at A by Dr Benedict, and this occurred at 4 feet, 9 inches at H. At F was an oblong fireplace of waterworn stones. Between the top stone and one on the west side of the inclosure part of a pottery rim was found. There were small sherds at H. In the ashes under the top stone were calcined bones. A human astragalus was found at B, 4 feet southwest of the central stake, at a depth of 1 foot, 9 inches, covered with several round stones, 6 inches to a foot in diameter and an inch thick. A calcined long bone was found 15 feet south of the stake, which seemed part of a human tibia. At 7 feet, 10 inches south from the stake the bottom of the mound was of burnt clay and gravel, about 6 inches thick. Below this was a hollow space, beginning 3 feet, 7 inches from the surface of the mound. This was 9 or 10 inches deep, and extended every way 2 or 3 feet. The floor of this was of coarse gravel, about the size of hickory nuts, blackened, but showing no disturbance. Charred wood was occasionally found, some of considerable size. There were also small bits of mica. These seem hardly true burial mounds, though containing human bones.

Other mounds have been reported in Erie county 15 to 16 feet high and from 45 to 54 feet in diameter. One near the Indian fort at Buffalo was 5 or 6 feet high, and from 35 to 40 feet across. It is probable that Dr Benedict's diameters may be too great, allowance not being made for increase at the base by washing down from above.

On St Regis island, Franklin county, was a mound 8 feet high, and another opposite, on the east bank of St Regis river. Burial mounds were frequent along the St Lawrence.

Small mounds have been reported on Tonawanda creek, in Genesee county, but they may not have been artificial, though used for sepulture. The mound at the Bone fort, near Caryville, was 6 feet high and 30 feet wide, almost entirely composed of bones.

Two small mounds have been reported in Jefferson county, and many hut rings on the east bank of Black river, Lewis county, opposite the Deer River station. These are like those at Perch lake.

In the summer of 1903 an early and notable ossuary was discov-

ered by Mrs R. D. Loveland of Watertown, near the long carrying place at the head of Chaumont bay. A curious depression arrested her attention, and a little digging brought to light a human skull. She then turned over the search to others, who unfortunately had not her knowledge and skill, and no clear description is available from them. Dr R. W. Amidon afterward visited the place, saw the relics, and obtained what information he could. Its importance comes from its age, the relics being mostly of early types. The pit is near and below the end of a ledge of Trenton limestone. At least 8 skeletons of vigorous adults were unearthed, from 2 to 4 feet below the surface, and mostly covered with boulders and flat stones. Two skulls were fractured, as though by a war club. A perfect clay vessel was destroyed by the diggers, but it was of a frequent form. A bird amulet, of green striped slate, was found. This was 5½ inches long, rather broad, and with the head and tail almost on a plane with the body. There was also a bar amulet of sandstone, 6 inches long, and a perfect soapstone pipe of a frequent form. A flat bone bead, bone and horn implements, flint arrowheads or knives, were among other articles. This ossuary thus gives us some idea of what other things were used by those who had these amulets.

In Livingston county there was once a mound in the road from Dansville to Groveland, which was 4 or 5 feet high and 30 feet in diameter. Another was midway between Dansville and Scottsburg. A burial mound was 2½ miles southeast of the head of Hemlock lake. One at Mt Morris was used for recent sepulture, but may not have been artificial, as it is said to have been 100 feet across and 8 to 10 feet high. Some accounts make the relics of early types, and it is probable it was used at various periods. On the Genesee river, near the Wheatland line, was a burial mound 8 feet high. Two mounds are also on the Wadsworth farm near Geneseo. One is 3 feet high, but not quite 25 feet across; the other is much smaller. Both have been reduced in size. A stone heap at Lima traditionally had a memorial character.

In Madison county, on Oneida lake, are supposed Indian mounds, which are probably natural formations.

There was a mound in Monroe county, a few miles northwest of Scottsville. Two small mounds were west of Irondequoit bay, on high land, the largest being less than 5 feet high. A large one was east of the bay, and another, east of the village of Penfield, was originally 40 feet in diameter and 8 or 9 feet high. Two burial mounds were on the east bank of Genesee river, half a mile below the lower fall. They were 4 feet high and 20 to 25 feet wide. There were other mounds in that vicinity. In Pittsford was a pile of large limestone boulders, the heap being about 12 feet square. Between Irondequoit landing and the lake was a cemetery of 200 small grave mounds, arranged in rows. The further character was not reported, but single graves are usually depressed. A mound was on the bluff south of Dunbar hollow, which contained stone implements. Mr Harris thought a small island on the west side of Irondequoit bay was mostly artificial, as proved by excavations and grading. It was 90 feet long, 32 wide and 17 feet high, but was not sepulchral, though it contained many fine articles at a depth of 15 feet.

A mound described in Cambria, Niagara county, should be called an ossuary and contained metallic articles. A stone mound has been reported a mile west of Lockport, and an ordinary one at Gasport. Two burial mounds of large size were on Tonawanda island. Another was in Wilson, and two in the town of Lewiston. In September 1903, the one marked D on Schoolcraft's map was opened. He called it "a small mound or barrow," but if it ever had much elevation cultivation had long before removed all signs of this. As it has not before been described a brief account of it will be given here. The first skull was found 6 or 8 inches below the present level of the ground, and the skeletons were estimated at over 300. Over 200 skulls were secured and none had been injured, the place representing well the ossuaries of Canada. The date may have been not far from 1620, perhaps a little later, while the Neutral nation still occupied land in New York. The pit, excavated by Mr John Mackay of Niagara Falls, was about 18 feet long and from 12 to 14 feet wide, with a depth of 3½ feet from the surface. The form was an irregular ellipse, and the bottom was of rock and clay. To

make more room the pit had been widened about 18 inches from the bottom, and the smaller bones were placed in this addition. There were no traces of any lining to the pit, nor any suggestions of Jesuit contact, while earlier articles of European trade had reached the spot, possibly from the Dutch through the Five Nations. There were 24 iron axes, several brass kettles, 3 sword blades, 24 large and curious brass rings, 5 cylindric brass or copper beads, with other ornaments of shell. Through the kindness of Mr Mackay I examined a number of these. The rings are simply short brass cylinders, bent in circles, and the beads are long brass tubes, precisely like those occurring in the Mohawk valley. One of these is 11 inches long and 5/8 inch in diameter. Mr Mackay has an interesting collection, well repaying study.

Some burial mounds have been reported in New York city, apparently natural elevations used for sepulture.

Some supposed mounds in Oneida county are also of doubtful character, nothing having been determined by examination.

In Onondaga county, near Baldwinsville, were two large stone heaps, covering human bones, and two burial mounds were on the west side of Onondaga outlet. One was circular and stood out prominently from the bank behind it. The other was oblong, being 12 feet long and 3 feet high when I sketched it, and had then been somewhat reduced.

At the modern Seneca castle near Geneva, where Johnson built a fort in 1756, is an artificial mound about 6 feet high and used as a cemetery. It is probably rather graded than built up. There was a small recent mound at Clifton Springs.

In Carlton, Orleans county, on the north bank of Oak Orchard creek, is a small oblong mound, 20 by 30 feet in diameter. Another small mound was 30 rods away.

Bone hill, at Oswego Falls, was a place of sepulture, now known to be of natural formation. It was 6 rods in diameter and 40 feet high, and has been removed.

In Unadilla was a supposed Indian monument, 20 feet in diameter, 10 feet high, and of a conical form. There was a mound at Oneonta, and a supposed burial mound at Cooperstown.

In Tioga county there was a circular burial mound at Owego. Several mounds were in the vicinity of Newark Valley. One of these was 15 feet high and 250 feet around, suggesting natural formation.

In Wayne county I examined several mounds July 18, 1902. One was northwest of Savannah and in the midst of camp sites. It is circular and but slightly separated from the ridge behind. It is 60 feet across and 3 feet high. Another burial mound north of Crusoe creek and northeast of this, is now small and low, but distinct. Another was examined 2½ miles south of Savannah. It is at the south end of a ridge containing caches, from which it has been separated by excavation. The bodies were apparently laid on the surface and the earth heaped upon them. It is 30 feet across and about 7 feet high. The first of these mounds shows little work.

In Wyoming county is a burial mound about 4 miles south of Portage.

In Yates county a small burial mound on Bluff point is 9 feet long and 4 feet high.

These are all the burial or monumental mounds thus far reported in New York, as distinguished from defensive earthworks. Very few indeed resemble those of Perch lake, and this led to the special examination of the latter. Their peculiar character is emphasized by this comparison with New York mounds elsewhere, and though scattered examples may yet be found here, it is quite probable that nowhere else in the State will they be seen in such numbers or in such fine preservation. They form a unique group, well worthy of further study, though offering little in the way of fine relics, or indeed of any at all.

By way of caution it should be remarked that the hight of mounds is commonly made too great unless accurately determined; and there is also a disposition to consider any symmetric elevation of moderate size an Indian mound. Even when human bones are found in them they are not always artificial.

A curious spot 1½ miles west-southwest of Unadilla may be described here, having never been mentioned before. For the account and chart, thanks are due to Mr Harry B. Cecil of that

place. It is on the farm of Enoch H. Copley and in a woodland of about 33 acres, the whole of which is a series of moraines and kettle-shaped hollows. In the largest of these hollows is a shallow pond, marked A in the diagram, plate 12, figure 1. The shaded part B has been partly filled in for the Delaware & Hudson Railroad. The pond is surrounded by moraines, C C C, about 100 feet high, and a road D, follows the north and east margins. At E, F, G, are rude stone walls from 2 to 4 feet high. Mr Cecil said:

At one time I supposed these had been constructed to get rid of the rocks that were in the way, but this could not be the case, as the stones could have been dumped into the pond very much more easily, and it would have materially helped to widen the road D. The oldest residents say that these piles and walls have always been there. At H, until a short time ago, were two circles made of rocks loosely thrown together. They measured 10 feet across and were contiguous, having openings at the remote parts of their circumferences. I turned these over carefully, but failed to find anything of Indian workmanship and the soil beneath was apparently undisturbed. At I was another stone wall. At J is a heap of undisturbed rocks. At K is a carefully made road, about 8 feet wide and extending about 300 feet in a westerly direction, gradually ascending to 50 feet above the pond level. No explanation can be given of this unless it was part of a trail. Below this road and above the wall at E, is a stone heap, and above the road is a large hollow filled up with stones of all descriptions. I am positive that these heaps are not natural. All these remains are included in about half an acre.

This account is free from extravagance and suggests the use of the spot as a pound for deer, terminating a driveway. These and other animals would naturally resort there to drink. With or without contracting hedges they would follow their own paths, and the roadway would turn them toward the double walls, I, F, when driven. Some would escape only to encounter other hunters at the wall G. In the press others might turn back and meet hunters at the wall E. The circles may have been the foundations of hunting lodges, and the season of wild fowl would afford a secondary use. The usual course was to make a pound of stakes and branches, but the primitive hunter was quick to avail himself of natural advantages, and was not sparing of work.

TRAILS

In the *League of the Iroquois,* Mr Morgan gave a definite and interesting account of the principal Indian trails of New York, overlooking some things which seriously affected his scheme. Sites of Indian towns were constantly changing, and trails of necessity changed and were forgotten. An abandoned forest path is soon obliterated. All his towns were not properly located if the record is to be considered two centuries old. Much of the time Indians took a general rather than a fixed course in going from place to place, for the advantage of hunting or for other reasons. Thus trails were very faint in some places, becoming plainer as they approached towns. Remembering such things, Mr Morgan's general plan will serve as a proper basis for some remarks on Indian trails. At some period it may have been essentially correct, but in the nature of things this was but for a brief time. With this reservation it deserves high praise.

His scheme makes the trail leave Albany along the old turnpike, going to a spring 6 miles west and thence to Schenectady, crossing the river at the ford, where a bridge was afterward built. This may be allowed, though it may not have been Van Curler's exact route in 1634. Yet it is doubtful whether there was any trail or much travel there before the Dutch came, for the Mahicans at Albany were at war with the Mohawks west of Schoharie creek, and made their footprints as light as possible. At Schenectady the trail probably divided, when there was one, following both banks of the Mohawk. When Van Curler followed that stream westward in 1634, all the Mohawk towns were west of Schoharie creek, and the Indians did not care to ford that for some reason. Curler crossed the river, followed the north bank till the creek was passed, and then recrossed to the south bank, where all the towns were. When all these were on the north side, a few years later, there was no use for the southern trail. When the south bank was occupied it was used again. Mr Morgan's scheme places but one small village on the north.

In 1634, and for some years later, all the Mohawk towns were between Schoharie creek and Spraker's. His scheme places

Te-hon-da-lo'-ga at the mouth of the creek, Canajoharie on the east bank of Ot-squa'-go creek at Fort Plain, and the upper Mohawk castle in Danube, Herkimer county. Thence his trail went to Utica, Whitesboro, Oriskany and Rome. This was a very recent route.

On the north he supposed that the trail turned off to Johnstown, a modern feature, returning to the river at Fonda, and going thence to Rome. This does not allow for the fact that as early as 1600 one Mohawk town was far up Cayadutta creek, another still farther on the Garoga, and a third on the Ot-squa'-go, all several miles from the Mohawk. Rome was not an objective point till western trade became vigorous, and there was probably little travel that way till the 18th century. Van Curler, in going to Oneida in 1634, certainly left the Mohawk east of present Canajoharie, crossing the hills to the upper waters of Oneida creek. Later accounts show that this was long the only great trail, and this fact Morgan overlooked. This affected his scheme beyond the portage. He said:

From Rome the main trail, taking a southwest direction, passed through Verona, Te-o-na-tale', and finally came out at Oneida Castle. This was the principal village of the Oneidas.

Knowing the latter was a recent town, Gen. John S. Clark placed Old Oneida in the southwest corner of Vernon, where Sauthier's map shows it. On his map of 1700 Colonel Romer marked his route as leaving the Mohawk at the third castle, thence southwesterly near the head of Schuyler lake, thence west to Old Oneida, whence a branch trail led to the portage. Being on horseback his party took the main road west to Onondaga.

From the modern Oneida Castle, Morgan's trail went through Canastota, Canaseraga, Chittenango and the Deep Spring, Manlius and Jamesville, to Onondaga Valley. No colonial traveler mentions Deep Spring, though one of Gansevoort's officers spoke of it as "Sunken Spring in the road," in 1779, and the Onondagas tell me that their favorite resting place was at Green lake, near Kirkville and north of this route. Johnson and the Moravians alike show that the main trail in 1756 was a mile south of Jamesville, entering Onondaga valley far south of the turnpike. The Moravian journals show that there were several trails between Oneida and Onondaga, touching the Tuscarora towns.

Mr Morgan's three Onondaga villages are not well located, as is easily proved. Ka-na-ta-go'-wa, or great village, is now where he placed it, but it was 3 miles north of this in 1779, the farthest north of all. There was no village at Gis-twe-ah'-na. In this scheme the trail passed up the hill west of the present village of Onondaga Valley, northwest through the sites of Camillus and Elbridge, thence through Sennett and Auburn, crossing Owasco creek just above the prison, following the old turnpike halfway to Cayuga lake, then going direct to the old Cayuga ferry, half a mile above Cayuga bridge. It crossed the foot of the lake about 4 miles farther north, at the old fording place near the lower bridge. This, however, was not the trail used by the Moravians and others in the middle of the 18th century. That went directly over the hills from Onondaga, at that time 4 miles south of the present canal, passed some miles south of Marcellus village, crossed the foot of Skaneateles lake and that of Owasco, reaching the village of Ganiatarage 1½ miles north of Union Springs, intersecting there the trail which connected the Cayuga villages east of the lake. This was also Colonel Gansevoort's route in going eastward from the foot of Cayuga lake to Fort Stanwix in 1779. The principal Cayuga village was at Great Gully brook, 3 miles southeast of Union Springs. From the mouth of this stream the lake was usually crossed in canoes, and the trail went on to the foot of Seneca lake, passing through the Cayuga village of Nuquiage, not far from that lake. This is an historic route from Onondaga to the first Seneca castle. That given by Mr Morgan seems much later.

In his scheme, after fording the foot of Cayuga lake, the trail followed the north bank of Seneca river to Seneca lake. He noted another trail, crossing the lake in canoes, and running west from the shore to Seneca Falls. Thence it followed the south bank of the river, intersecting the other trail at the lake, and running 1½ miles north to the first Seneca castle, near Geneva. Thence it followed nearly the line of the turnpike to Canandaigua, at the foot of that lake.

The Moravian journals make quite a difference here. From the foot of Seneca lake they went 4 miles west-southwest to a deserted

town, where the trail divided, one path going to the head and the other to the foot of Canandaigua lake. There were others to various points. At last they found the right one, but a very bad road. This took them through old Onnachee in Hopewell, and Canandaigua lake was then called by this name. The outlet was crossed on a rude Indian bridge. Ganataqueh (Canandaigua) was a few miles beyond, on a hill. Thence they went to Hachniage (Honeoye) near the foot of Honeoye lake. Still going west they crossed Noehnta creek, the outlet of Hemlock lake, and came to Ohegechrage or Conesus lake. Ten miles farther they reached Zonesschio (Geneseo) on the Genesee river, but not the later site.

This is essentially one of Morgan's two trails. One of these went southwest from Canandaigua to the foot of Honeoye lake, then in sight of Hemlock lake, passing the foot of Conesus lake, crossing the Genesee at the present Geneseo, and leading to Little Beard's town, at one time the largest Seneca village. This had no existence in 1750 on its later site, and Geneseo was then near the mouth of Canaseraga creek.

The other trail, considered the main one by Morgan, went from Canandaigua through the villages of West Bloomfield and Lima, to Avon on the Genesee, crossing the river a few rods above the bridge, and following the bank to Ganowauges a mile above. This is satisfactory for quite recent times, but it leaves out the important early villages near Honeoye Falls and in Mendon, as well as the great fort and town near the village of Victor. The great trail certainly once included these. Guy Johnson's map of 1771 has two of these trails from Canandaigua, and a third one farther south. Pouchot's map of 1758 is of more interest than value, as he probably had not been over the road, but notes on these various charts may be reserved for an appropriate place.

The remaining section of the main trail, as given by Morgan, lies west of the Genesee river, in a region where there were no Seneca villages in 1650. It led from the river to the great Caledonia spring, then through the village of Leroy, crossing Black creek near Stafford and striking Tonawanda creek a mile above Batavia. Passing through that place, it turned northwest through Caryville,

and led to the present Seneca village of Tonawanda. There it branched. One path led northwest, through the creek and swamp, past Royalton and then to the Cold spring 2 miles northeast of Lockport. Continuing northwest it reached the ridge road and terminated at the Tuscarora village near Lewiston. This latter trail of course dates from the occupation of that reservation.

The other branch went southwest from the Indian village to Akron and Clarence Hollow, thence to Williamsville and the head of Main street, Buffalo, where it ended. Mr Morgan said:

> This trail was traced through the overhanging forest for almost its entire length. In the trail itself there was nothing particularly remarkable. It was usually from 12 to 18 inches wide, and deeply worn in the ground; varying in this respect from 3 to 6, and even 12 inches, depending upon the firmness of the soil. The large trees on each side were frequently marked with the hatchet. *Morgan*, p.429

It remains to notice his lake and river trails. From Oswego one followed the lake ridge to Irondequoit bay, turning up the bay to its head, crossing the Genesee at the Rochester aqueduct, striking the ridge road at the lower falls and going west to the Tuscarora village, a recent town.

A trail followed the Genesee river on each side, connecting the recent Seneca villages occupying the valley. These need not be mentioned here, and for many interesting details the reader is referred to Morgan's valuable work.

Trails naturally converged at Tioga point, where the Chemung united with the Susquehanna, and these became important thoroughfares for the Iroquois in their later wars. From this point he named two trails up the Susquehanna. One followed the north bank, crossing the Chenango at Binghamton, thence to the Unadilla, and there intersecting the Oneida trail. The trail again branched at Charlotte river, one branch going to the Cherry Valley creek and then to Canajoharie. The other followed the Charlotte to its head, crossed to the Cobleskill, intersecting the Schoharie trail at Schoharie creek, ending at the lower Mohawk castle. A branch turned up Foxes creek, crossed the Helderbergs and ended at

Albany. This was the Indian Ladder road. Another crossed the town of Middleburg to the Catskill, following that stream to the Hudson.

It is evident that these trails came from the recent occupation of Schoharie creek by the Mohawks, of the Susquehanna by the Oneidas and Tuscaroras, and of the Chemung by the Cayugas; in part by all. In 1753 there was no road at all along the north bank of the Susquehanna from Owego to the Chenango river.

It is so obvious that most trails came from the situation of towns, changing as these did, that it can be assumed that trails connected all friendly towns of any given period. Their rapid obliteration may also be inferred from the fact that no one pretends to locate, by physical features or oral tradition, any trail used 250 years ago. We know the general course of some yet older, but not because any one has seen their traces. In still more cases we know where early towns stood, but have no hint what thoroughfares led to other places. These certainly existed, but have left no visible signs. Indeed it is quite probable that the later trails had their prominent features more from the white man's shoes and the hoofs of cattle than from the Indian's moccasin. Woodland paths are common now by every lake and stream; when and by whom were they made? Ask our farmers, hunters and fishermen.

That Indian trails were well defined from Utica westward, soon after the Revolution, no one will doubt. That some of them afforded the best lines of travel for pioneers is just as clear. The Indian was a well trained woodman, and the white man profited by his skill, but in the nature of things the great results would have been much the same had the latter been left to himself. The New York Central Railroad would have gone from Albany to Buffalo had there never been an Indian trail in the State.

Some of these early routes have interest, and the location of some on early maps may be mentioned. A few local trails will be also referred to, but it is evident that no complete account could be given unless we knew the age and nationality of every town.

The earliest trail which can be traced westward from Albany is from the itinerary of Arent Van Curler in 1634. His recorded miles

are each equal to about 2 English miles, and the latter will be used here. There were then no white settlements west of Albany, and the Mohawks were all west of Schoharie creek. The first day, having traveled 16 miles, he was near the Mohawk river. The second he went 2 miles, crossed the river and walked 20 miles more. The third he recrossed the Mohawk, and a mile farther came to Onekagoncka, the first Mohawk castle. A mile farther Canowarode was passed, and Senatsycrosy at the end of another. Canagere, the second castle, was 3 miles beyond, or 44 from Albany. The third castle, Sohanidisse, was 3 miles farther. Osguage was a mile beyond, and Cawaoge still another. The fourth castle, Tenotoge, was 2 miles farther, east of the present Canajoharie, and about 51 miles from Albany. For at least 13 miles he had followed the south bank of the river. Like later travelers, he now soon left it. Leaving Spraker's he took a westerly course, crossing Canajoharie creek but passing south of the next large stream, the Otsquago. That day's tramp of 14 miles ended on high land near the west line of Montgomery county. The next day 15 miles brought him near Jordanville. Next day he crossed two branches of the Unadilla, probably near North Winfield and North Bridgewater, or a little farther south, camping a little west of the west branch, after walking 15 miles. The next day their course was near Sangerfield or Waterville, but at the end of 16 miles they had not quite reached Oriskany creek. This they saw next morning, and at the end of 9 miles they were at Oneida, east of Oneida creek and near Munnsville. They walked through the snow, and the miles seemed long.

The records of the sojourn of Father Jogues, in 1642 and later, tell us nothing of the main trail, still on the south side of the Mohawk, but show many minor trails from place to place and for many purposes, as we might expect.

The famous horseback ride of Wentworth Greenhalgh in 1677, when he went from Albany almost to the Genesee river, shows a little variation. There were four Mohawk castles and one small village, all on the north side of the river. That he followed the same trail as Van Curler when he left this, may be gathered from

his saying that Oneida was "about 30 miles distant from the Maquaes river, which lyes to the northward." Onondaga was still in Pompey, about 2 miles south of Morgan's later trail. The Seneca towns lay north of that route, and he passed Cayuga lake by some path available for horses, evidently on the north.

The trail from the last Mohawk castle to Onondaga changed but little for a great length of time, and only as the two places and Oneida changed their sites. It was always the practice to leave the river at the upper Mohawk town, and take the direct overland trail. This is the route laid down on Colonel Romer's map of 1700, and when Johannes Bleeker jr and David Schuyler went to Onondaga in 1701, they said that they got to Eghwake creek, the east branch of the Unadilla, on the evening of June 7. Oneida had been moved northeast of its former site, and they reached there next day. Part of the early trail had been abandoned, but much of it was still used.

At that time there was little land travel along the Mohawk above Little Falls, yet the portage at Rome was sometimes used. On Colonel Romer's map a trail leads from Oneida to that spot, and runs at right angles to the main road, from which it was a short day's journey. When a trading post was established at Oswego it became an important thoroughfare. This is what Romer's companions wrote in October 1700:

10th Col. Romer told us that his instruccòns were to see how much lesse the Carrying place could be made; whereupon we resolved forthwith to go thither, as we did, with an Indian which we hired who shew us the way. *11th d°* We came by a most miserable path to the Carrying Place, w^ch^ we viewed as farr as the Wood Creek, when Col. Romer resolved to go to Oneyda. *12th do.* In y^e^ evening we came to Oneyda. *O'Callaghan,* 4:807

From this and the map it will be seen how far the portage was from the main trail. On the map the trail goes from Oneida to Onondaga, then on Butternut creek, and from that town the party traversed two trails only: one to Onondaga lake and the other to the fishing place on Chittenango creek.

A few years later Onondaga was moved to the east side of Onondaga creek, but this removal had most effect on the branch trails,

the main one changing but little, still passing the old town a mile south of Jamesville, where the pickets long remained.

Guy Johnson's map of 1771 has a trail from Oneida, through "Ganaghsaraga, a Tuscarora town" to Onondaga, and thence by way of Owasco lake to the foot of Cayuga, following the north bank of Seneca river to Seneca lake and Canadasegy. Canadaragey (Canandaigua) next appears, and there are three trails thence to Genesee river. The southern goes by Anarara (Honeoye) to Chenussio; the middle one direct to the same place, and the third to Canawagus, while another runs northeast from Canawagus to the head of Irondequoit bay. From Geneseo the trail goes direct to Fort Schlosser on Niagara river, and small villages appear along the way. A trail ascends the east side of Genesee river, and elsewhere Kanestio is connected with Ganuskago (Dansville). There are no trails on the Susquehanna, the river being used instead.

Sauthier's map of 1779, made by order of Governor Tryon, shows some of the changes made as the frontier extended. Some of the earlier trails still appear south of the Mohawk, but there are new starting places on that river. The German Flats afforded two, and there was another road on the north side. Fort Schuyler (Utica) had become a starting point for Old Oneida and the towns beyond. On this trail were Old Oneyda, Canowaroghare, (now Oneida Castle), Canadasseoa and Canassaraga Castle, two Tuscarora towns. From the latter one trail went to Three Rivers, and another to Onondaga, then on Onondaga creek. From Canowaroghare one went to Fort Stanwix, and another to the Royal Blockhouse by way of New Oneyda Castle (now Oneida Valley). From the latter place one reached Wood creek, while another went to Fort Stanwix. Among others one went due north through the wilderness to Ogdensburg, then called Oswegatchie.

Lieutenant Lodge's map, made in the campaign of 1779, carries the trail south of Conesus lake. Pouchot's map has some special features, but they are of doubtful value. The Jesuit *Relations* contribute little on this subject, though some make it clear that there was a good trail from Salmon river to Onondaga by way of Brewerton, and apparently one from the same place to Oneida

passing the other end of Oneida lake. On the Jesuit map of 1665 the Black and Oswegatchie rivers both bear the title, " R. qui vient du costé d'agné " or the Mohawk country. By the latter route the Mohawks took Father Poncet back to Canada in 1652. For a considerable part of the way the routes were one. Gen. J. S. Clark has elaborated the full route very clearly, in a note to Rev. Dr Charles Hawley's translation of the *Relations* as they concerned the Mohawks. He supposed that one trail from the Mohawk followed its north bank to Rome, continuing along the line of the present Rome & Watertown Railroad till it struck Salmon river, 10 or 12 miles from the lake. From the Mohawk another followed the west bank of West Canada creek and near the line of the Black River Railroad and Black river to Great Bend. Lake Ontario might then be reached by following the stream, or by a portage of a few miles to Indian river the St Lawrence might be entered through the Oswegatchie. The usual war path of the Mohawks was through Lake Champlain and the Sorel river. The lake was reached by several trails.

The trail by which the French usually came to early Onondaga led from the mouth of Salmon river to Brewerton, and thence it varied as the village moved. The French at last came by way of Oswego. Champlain also came by way of Brewerton, but where he left Lake Ontario has been much disputed. It was far to the northeast of Oswego, and Salmon river has been thought a probable place. That he crossed the Chittenango at Bridgeport is likely, and that he followed a trail is evident from encountering a party going to the fishing place. The path probably led up the ridge east of the Chittenango valley, but has left no traces.

The trails leading to the Susquehanna valley became important nearly 200 years ago, when the Iroquois land claims in Pennsylvania assumed a new aspect. They had been matters for diplomatic action even in the 17th century. When the Iroquois realized that there was money in them they sent a resident viceroy to rule their subjects there and care for their lands. This and their southern wars led to many journeys. As early as 1737 Conrad Weiser was sent as an ambassador to Onondaga by way of Owego. In 1743

he went again with quite a party on horseback, and in the party were John Bartram and Lewis Evans. The latter made a map of the route, the former wrote the itinerary. In 1745 Bishop Spangenberg came over much the same route, and his party also rode. In 1750 Bishop Cammerhoff and Zeisberger tried a different course, coming in canoes as far as Waverly on the Chemung river, and going thence to Cayuga on horseback. While previous travelers had gone by way of Owego creek and Cortland county, they followed Wynkoop creek, passed Cayuta lake, reached the site of Ithaca, and went down the east side of Cayuga lake to the Cayuga towns. All of these journals are of interest, but while some parts of the route are easily recognized, some are hard to identify, nor was the path always quite the same, even in going and returning. Between Bartram's account of the road and that of Spangenberg there is quite a difference, though they had the same guides and made the trip but two years apart.

Each may be summarized after leaving Owego. Bartram's general course was on the east side of Owego and West creeks, crossing a steep hill to a tributary of Fall creek, and passing some ponds in the town of Cortland. From the site of Homer he followed the west branch of the Tioughnioga, seeing Mount Toppin but not the ponds near by, and crossed to a branch of the Susquehanna rising in Pompey. Part of Pompey hill was crossed and the Indian village in La Fayette visited. The Onondaga valley was entered from the southeast. The route was slightly changed on the return, and a branch trail led to Onaquaga.

In his notes on Spangenberg's journey in 1745, Mr John W. Jordan made his route up Owego and Catatonk creeks, leaving the latter above Candor, crossing Ganatowcherage or West creek in Richford township, passing over Prospect hill in Harford and a creek in Virgil which is an affluent of Fall creek, and reaching Crandall's pond in Cortland. It may be that the route was up West creek instead of Catatonk, as in Bartram's route. From Crandall's pond or Lake Ganiataragachrachat they went to Big lake or Ganneratareske in Preble, and thence to Oserigooch, the largest lake

in Tully. Beyond this the trail was bad, but they went by way of Cardiff, as later travelers did. Most of the trail to Owego was so little used that it was hardly discernible even to Indians, who depended as much on the lay of the land as the actual path.

Zeisberger and Frey attempted this route alone in 1753, starting properly from Owego, but losing the faint trail so often that they were discouraged and turned back. Afterward they were told that if they had gone on a day longer they would "have had a good road, because two roads meet there, and a road branches off, turning toward Cayuga lake. It is much frequented." Their observation on this is of interest:

> The Indians had no proper trail, but where they cannot distinguish it each one runs through the woods according to his own judgment. Consequently it frequently occurs that from two to three miles, and farther, there is no visible road. *Zeisberger,* p.1753

On this occasion they finally went up the east branch of the Tioughnioga by canoe as far as they could, leaving it northeast of Cortland and crossing the hill to Onogariske creek, now called the west branch of the Tioughnioga. When they left the river the Indian guides "ran hither and thither into the forest, until at length they found a path." They reached the west branch between Homer and Preble, and "the trail that comes up from Owego, and is quite clearly defined here." At the lake the trail divided, one branch going to Onondaga and the other to the village of Tueyahdassoo, where other trails diverged.

It is evident that hundreds of trails have left neither trace nor tradition, though some were once of great importance. Wherever there were towns or frequent camps there must have been forest paths. In a score of counties there was a network of these, old and new, almost as complex as our own roads now. No general scheme of these is possible, but it may be assumed that all early towns were connected and most lakes and valleys were accessible by them. Even distant points were reached by the most practicable routes. There were war paths, hunting paths and paths of peace. Very few of these are on record and it will suffice to mention those briefly.

In Albany county the Indian Ladder road is well known, a recent trail from Albany to the Schoharie valley, crossing the Helderbergs in Guilderland. Five trails were mentioned in Rensselaerville in 1711, and the Schenectady trail soon became important.

In Broome county the trail to Binghamton, over Oquaga mountain and another nearer Windsor, were worn deep. These were recent, there being no early settled occupation of the county.

In Cattaraugus county a trail ran through Carrollton, following Cold Spring creek and passing into Napoli on lot 41. A trail from Allegheny river followed the same creek into New Albion. Thence it went to Niagara Falls and Canada.

In Cayuga county some trails appear on maps relating to Sullivan's campaign. Gen. John S. Clark placed Thiohero "at the foot of Cayuga lake, on the east side, at the exact point where the bridge of the Middle Turnpike left the east shore. The trail across the marsh followed the north bank of an ancient channel of the Seneca river." The early trails were very many, and the Moravians described some.

There are a few trails on record in Chemung county, and some appear on the Susquehanna in Chenango county. In Columbia county the stone heaps were by Indian trails, and on the map of the Livingston patent a trail crosses it midway from east to west. Reference has been made to trails in Cortland county, followed by the Moravians.

A wide trail followed the Charlotte river in Delaware county, in 1786. In Franklin county are early and recent portages. A trail called the Catskill Path led from Castle Heights due north to the Coxsackie plains in Greene county. Some recent portages alone represent the many early trails of Jefferson county, but the recent trails of Madison county are better known. One of these was from Oneida to Chittenango, and thence to Onondaga, passing some distance south of Canaseraga. A well defined trail went from Oneida creek, through the west part of Hamilton, and down the Chenango river. The Oneidas and Tuscaroras came up that river in canoes as far as they could, and diverged to their several towns.

Mr George H. Harris has left us an excellent account of the trails in the lower Genesee valley, and his judicious remarks are quoted here:

In general appearance these roads did not differ in any particular from the ordinary woods or meadow path of the present day. They were narrow and winding, but usually connected the objective points by as direct a course as natural obstacles would permit. In the general course of a trail three points were carefully considered—first, seclusion; second, directness, and, third, a dry path. The trail beaten was seldom over 15 inches broad, passing to the right or left of trees or other obstacles, around swamps and occasionally over the apex of elevations, though it generally ran a little one side of the extreme top, especially in exposed situations. . . Fallen trees and logs were never removed, the trail was either continued over or took a turn around them. The Indians built no bridges, small streams were forded or crossed on logs, while rivers and lakes were ferried on rafts or in canoes. *Harris*, p.37

To these general rules exceptions will be found, as in the case of bridges, and sometimes swamps. Mr Harris noted a branch trail from Canandaigua lake to the head of Irondequoit bay, then to Genesee falls and along the lake ridge to the Niagara river. Trails converged above and below Rochester at two points. The trail from Canandaigua was on the Pittsford road, dividing a little east of Allen's creek, and going to Brewer's landing. Several branch trails diverged from it. The other trail reached the river near Franklin and North St Paul streets.

A trail came to South Rochester from Caledonia springs. Several others are mentioned in and about the city, two being portage trails. There were others about Irondequoit bay, but he differs from Morgan only in added details. Mr O. H. Marshall also described the trails followed by De Nonville's army in 1687.

Mr Irving W. Coates said that five trails met at Littleville, on the Canandaigua outlet in Ontario county, and traced their general course. Others were mentioned in Sullivan's campaign and in the Moravian journal.

Mr Jeptha R. Simms mentioned several trails in Schoharie county, with more details than Morgan gave. In Ulster county a great trail started from Saugerties, followed the Esopus, crossing to the

Rondout at Marbletown, leaving that stream at Napanoch, passing through Mamakating hollow, and reaching the mouth of the Neversink river at Port Jervis. In these and other cases most of the trails are modern.

With these data before us, and admitting a general truth, we can see that the Cayuga chief Wa-o-wo-wa-no'-onk, or Peter Wilson, was somewhat rhetorical when he said:

> The Empire State, as you love to call it, was once laced by our trails from Albany to Buffalo,—trails that we had trod for centuries—trails worn so deep by the feet of the Iroquois that they became your roads of travel, as your possessions gradually eat into those of my people. Your roads still traverse those same lines of communication which bound one part of the Long House to the other.

ADDENDA

The work of examining collections and sites has thus far been a personal one, the practical results of which come to the State Museum. It is a present gratification to secure figures and descriptions for record and preservation, but it is hoped that this will be of future advantage to the public. Out of these may be selected many for publication by the writer or others. Since the bulletin on metallic implements was published several fine articles of native copper have come to light and been figured, described and recorded, but they are axes, spears and celts, much like those already figured. A later history has been secured of the largest native copper implement found here, and drawings have been made of some recent metallic pipes. Bone articles are still obtained, Onondaga and Montgomery counties yielding most harpoons. One unique bone article belongs to Mr H. A. Pride of Holland Patent. It is flat, curved, and much like a small double pointed harpoon, with a single barb toward each end of the concave edge. This edge expands toward the center, allowing a perforation in the widest part. The convex edge has notches and one surface is ornamented with lines. Mr Pride has some fine pipes and one undrilled bannerstone of striped slate. A fine flat and curved bone article, which he took from a grave, he gave to the writer. It is sharp at both ends and has parallel grooves at one.

Mr Fred C. Gabriel has found many peculiarly grooved and worked elliptic pebbles on the west side of Seneca lake near Watkins N. Y., the grooves being picked or ground, and usually the long way. Some are otherwise worked. They could not have been used as hammers and seem too elaborate for sinkers. Being usually found in pairs they suggest the bolas, and this or the sling stone might have been moderately used in open woods. In dense woods they could not have been thrown, but the Indians often burned the underbrush. Such stones occur on Cayuga and Seneca lakes, but mostly at the head of the last. Some graves near the latter lake have been particularly described. A fine stone bird pipe was also found near Watkins. The claws, tail and closed wings are well defined, and

it is 3¼ inches high. An unfinished bird amulet was also found there, and also a cuneiform slate knife, a rarity in that region.

A fine red sandstone plummet, 3⅝ inches long, is from Howland island, north of Cayuga lake, the farthest west any such article has been found on Seneca river. A beautiful and slender one is from Jefferson county. A smooth pipe of red sandstone, found near Savannah N. Y., weighs 1 pound 5¼ ounces. A peculiar Onondaga clay pipe, with many grotesque human faces, has heretofore been found only on a site west of Cazenovia. A stem now in the writer's hands, came from Canoga, on the west shore of Cayuga lake. It has the character of all the rest, but had been carried there and used as a bead.

A grave was opened near Athens, Greene co., in 1899 by Dr A. H. Getty of that place, on the Saunders farm. It was in a sand bed and paved with cobblestones brought several miles. The remaining bones and relics were about 4 feet under ground. It contained 300 globular native copper beads, 16 good sized shell beads of unusual form, 4 longer ones perforated at each end, and a slate gorget with one hole. All these are now in the State Museum.

In the fall of 1903 Mr E. Hollenbeck found an olive green tube of banded slate at Hoffman's Ferry. It is somewhat flattened and has a groove across one end. Near this is a small lateral perforation, much like the vent of old guns in appearance and position. In this respect it is unique. The length is 4½ inches.

An ossuary was opened Sep. 8, 1904, in low ground, a mile east of Macedon, Wayne co., and near the creek. Dr C. P. Jennings, who superintended the excavation, writes: "We found there, in one pit, at least 60 skeletons within an area of 1 rod square and about 3 feet deep." Six large stones were found with these, but no relics.

Mr J. E. Mattern, of West Rush, Monroe co., writes: "I know of a few burial sites not mentioned in your bulletin on sites. One is about 6 feet in diameter and I took about 20 skeletons out of it. The bones were in all shapes. They were thrown in after the flesh was gone. Last fall I found another about 10 feet from the one mentioned, still larger. I took out 30 skeletons and did not dig it

all out. I found a flint knife, 3 shell beads and a bone awl." He reported 10,000 pieces in his collection.

In Watertown, Jefferson co., Mr R. D. Loveland added nearly 40 pipes in 1904 to his already fine collection, and a large number of bone articles. In both there were pieces of very great interest. A barbed bone fishhook is now in his cabinet. Messrs Amidon, Getman, Loveland, Woodworth and others could furnish a notable exhibit for the Jefferson county centennial.

The evolution of the human face on pottery has been finely illustrated by a complete series from Jefferson county. First are the three circles arranged for eyes and mouth; then three horizontal ellipses, either in lines or excavations; these are next inclosed in a diamond, followed by a pentagon and hexagon; then lines are incised for the nostrils and sides of the nose; and last comes the human face, as yet rare in that county. The absence of this class of pottery from Oneida sites has long been a matter of surprise to the writer, but now he has an example from Fish creek in Oneida county, though none from a village site. This has the slender form of a man, with the usual conventional body and limbs. A still more interesting find was that of Mr A. B. Skinner on Staten Island made last spring. On a camp site he found most of the rim of an earthen vessel, having "rude raised human faces upon it." They are small, four in number, and at some distance from the top of the vessel, which had a pointed base, like most others there. It should be added that it was from a shell heap, of which Mr Skinner said: "No horn or bone implements obtained here. Recent relics, such as a brass arrow point, bullets, gunflints, etc., have been found." The inference would be that it was either the work of an Iroquois captive or of an Algonquin who had been in the hands of that people, at a recent date.

A gouge with ridged back, from Lysander, is of interest, and long and fine gouges have been found in Chautauqua county. One collection has several fine stone mortars from Seneca river, and another has one which is long, elliptic and shallow. A small and deep one came from Chautauqua county. A curious and pretty one is from Oneida creek and may have been used for paint. It is small and

almost globular, being 2¾ inches wide by 2 deep, flattened below, and with an excavation nearly an inch in depth. From the same place came a fine elliptic grooved granite hammer, 6⅝ inches high by 3½ thick. A rougher one was found with this. Mr Skinner reports a number of grooved axes found on Staten Island, of various types. One weighed 15 pounds, which makes it one of the largest size. They are rather frequent on Long Island, and occur also along the Pennsylvania line.

In the bulletin on wampum it was noted that a wampum belt attached to an Oneida treaty of 1788 could not readily be found for illustration. It is now on exhibition in the State Library with the original record, and is well worth attention from its beauty and known history and use. The length is about 27 inches, with 6 rows and 4 diagonal double bars on the white ground. In the *Archaeological Report of the Province of Ontario*, 1901, are figures and accounts of 4 fine Ottawa belts. One has the date of 1764 on it, and another of 1786. A third has an officer's name, and may be assigned to 1815. The fourth is credited to the same year as the first. Among other belts examined is one now in the National Museum, which is 2 feet long and 8 rows wide. An open square at each end is joined to the other by a central black line.

Ap. 11, 1903, Mr Alanson B. Skinner read a paper before the Natural Science Association of Staten Island on aboriginal sites found there, enumerating 24 of these, but afterward adding two more. The following are those mentioned in his paper, but he said that there were probably others along the south and east shores not yet observed.

1 Village and cemetery at Pelton's cove, between Livingston and West New Brighton. The cemetery was large.

2 Village at West New Brighton, between Cedar and Dongan streets. Skeletons and implements were found in the spring of 1903.

3 At Mariner's Harbor was a village site between Blue-Bent field and Western avenue, near the shore. Shell heap opened in 1902 near Arlington station. Grooved axes and other early articles.

4 Village on Tuinessen's or Old Place neck. The earthen vessel mentioned came from a shell heap there. Recent relics.

5 Relics abundant in sand dunes and hills at Bloomfield.

6 Lodges about Watchogue road, near Union avenue, Chelsea.

7 Lodges along the north side of Long neck, Linoleumville.

8 Lodges on the south side of the neck. No relics in shell pits.

9 Site with graves at New Springville, on Corson's brook.

10 Camp between Journeay avenue and Annadale road, Green Ridge. Early relics.

11 Small village on Lake's Meadow island. Early relics.

12 Small village on Sandy brook, between Pleasant Plains road and Journeay avenue. Early relics.

13 Lodges from Cedar hill to Winant's brook, and along the shore to Rossville. Early relics.

14 Shell mounds and cemetery near Billopp house, Tottenville. Early and recent relics. Grooved ax of 15 pounds.

15 Site at Bunker hill, Huguenot, near Arbutus lake.

16 Shell heap on bluff near Seguine's point.

17 Site on Richmond avenue, near Arrochar station. Probably others near.

18 Camp at Harbor hill, New Brighton, a little above Castleton avenue.

19 Camps at Silver lake. Relics along the shore near St George.

20 Camp on Harbor hill near Harbor brook and Lafayette avenue.

21 Camp near Bard avenue and Clove road, above Schoenian's pond.

22 Large camp back of Richmond, near Ketchum's mill pond.

23 Shell heap on salt meadow, Oakwood, near Lake's mill.

24 Site with many triangular arrows on Ward's hill, near Cebra avenue, Tompkinsville. There were shells and scattered relics near most of these places.

EXPLANATIONS OF PLATES

Plate 1

Road map of Perch lake and vicinity, from an atlas of Jefferson county. In this the lake differs much in outline and extent from the contour map, but may have been fairly accurate at an earlier day. All remaining mounds on the east side are between the highway and the lake. In a few cases they are at some distance from the shore. Quite a space separates this long group from the one on Linnell's island. It is said that some mounds were formerly near Seven Bridges, on Perch river.

Plate 1

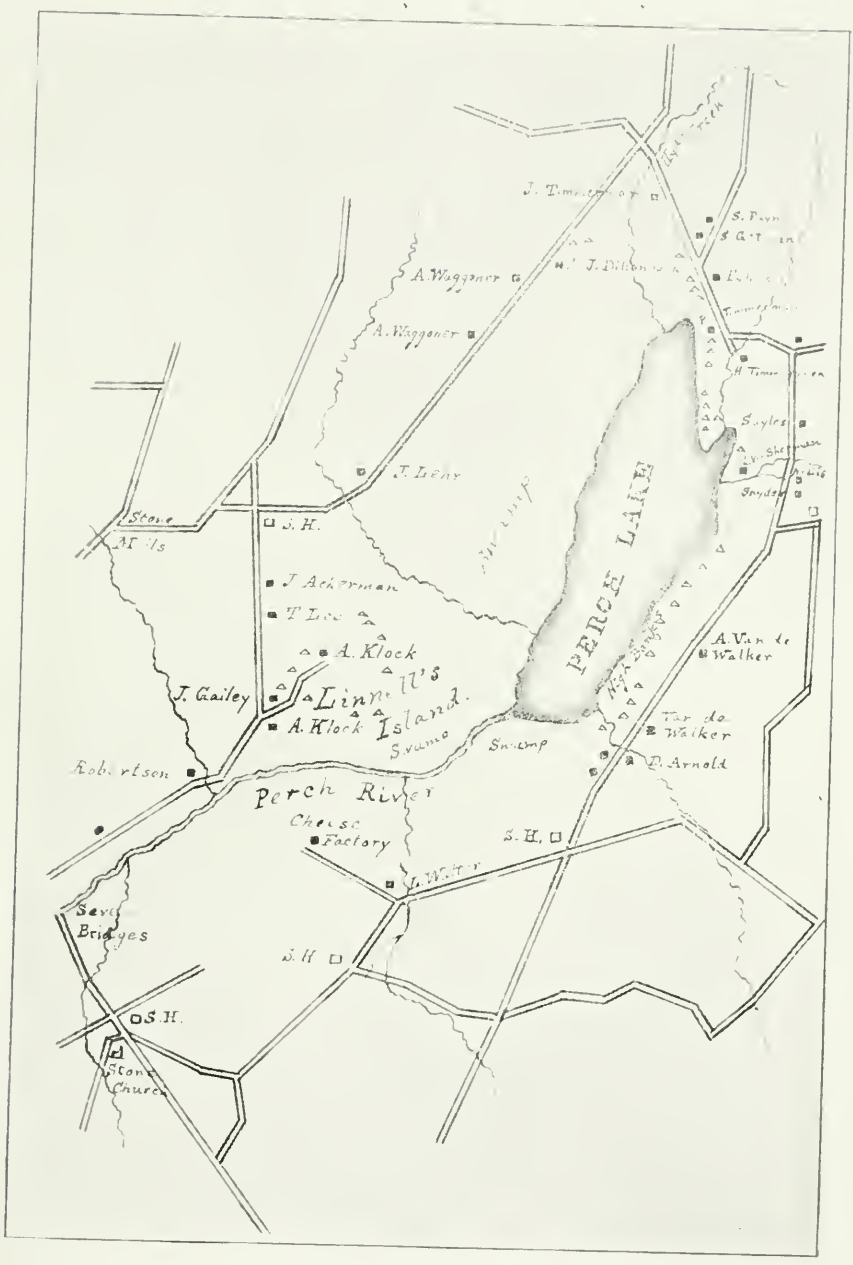

A. Waggoner
A. Waggoner
J. Lehr
S. H.
J. Ackerman
T. Lee
A. Klock
J. Gailey
Linnell's Island
A. Klock
Swamp
Swamp
Robertson
Perch River
Cheese Factory
S. H.
S. H.
S. H.
Stone Church
PERCH LAKE
A. Van de Walker
Van de Walker
P. Arnold
Snyder

Plate 2

A sketch map of Linnell's island, by Dr Getman, showing the general arrangement of mounds observed on the Klock and Gailey farms in 1903. This terrace is southwest of Perch lake, and was formerly surrounded by swamps, showing a higher stage of water in the lake in earlier days. This subsidence has greatly changed the outline of the lake.

Plate 2

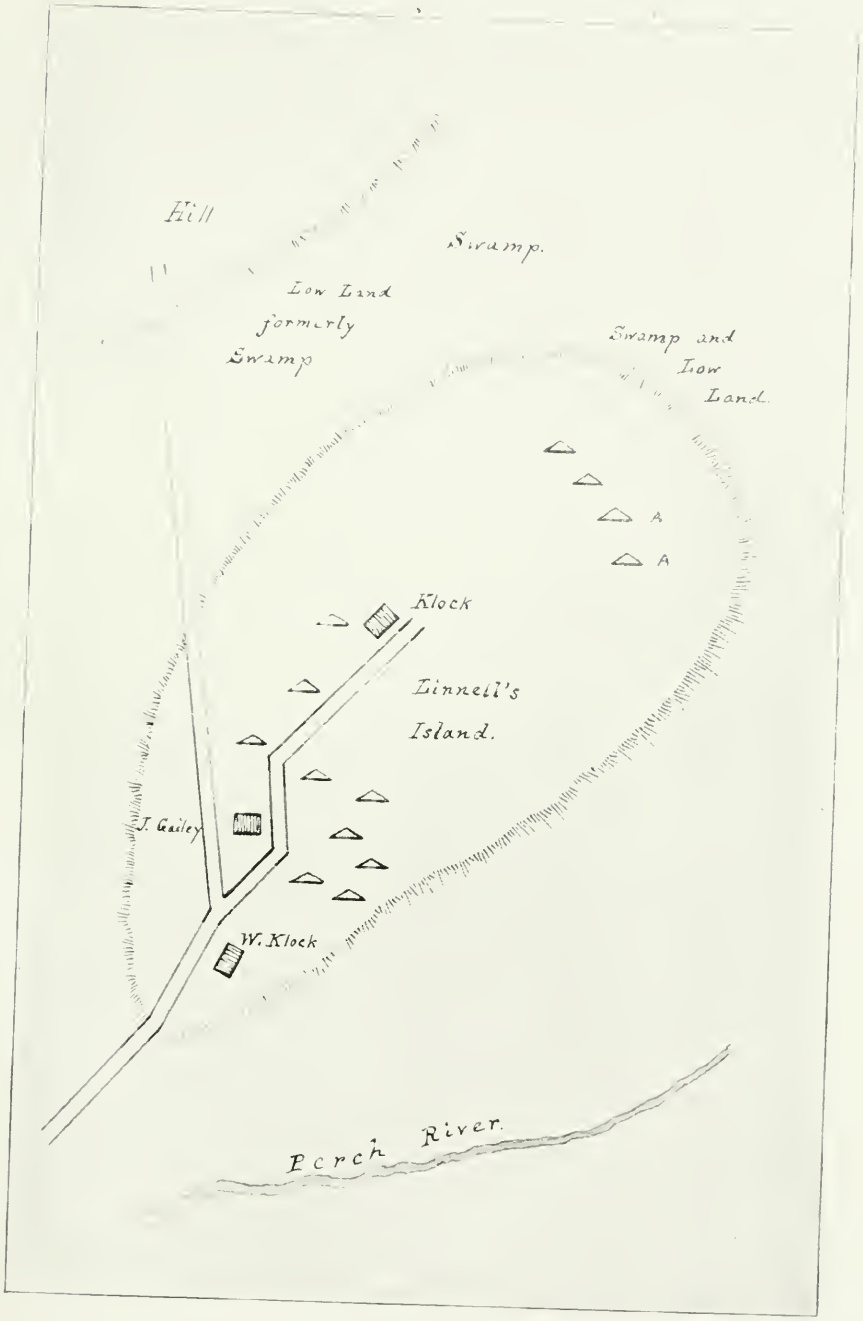

Hill
Swamp.
Low Land
formerly
Swamp
Swamp and
low
Land.
A
A
Klock
Linnell's
Island.
J. Gailey
W. Klock
Perch River.

Plate 3

Contour map of Perch lake and vicinity, showing numerous low terraces in the thin soil. In many parts these terraced rocks are nearly or quite bare. On the southeastern shore of the lake the slope is quite abrupt. On the west shore the extensive swamps, separating the cliffs from the lake, probably always hindered much occupation, but the proximity of the river to Linnell's island made that a desirable residence.

Plate 3

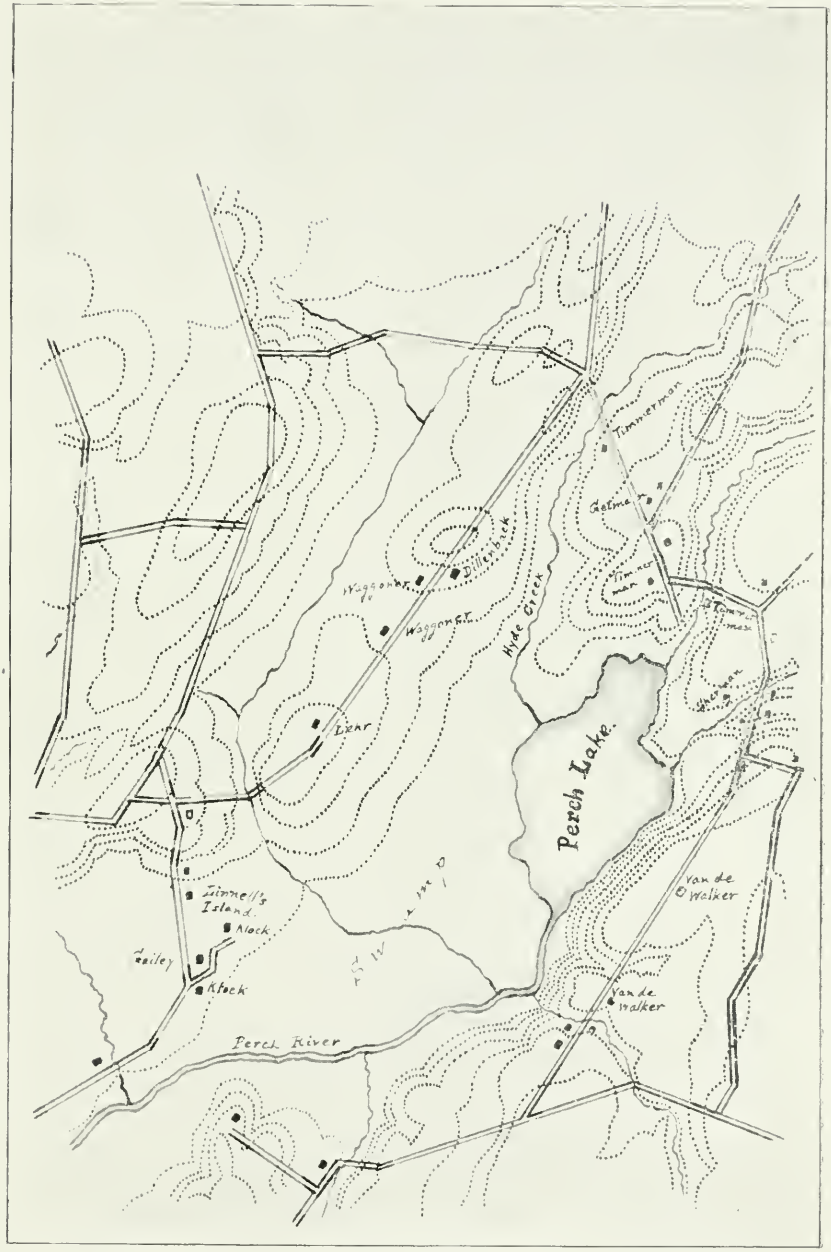

Perch Lake
Perch River
Timmerman
Timmerman
Timmerman
Timmerman
Timmerman
Dillenbeck
Waggoner
Waggoner
Hyde Creek
Lyon
Timmell's Island
Block
Bailey
Block
van de Walker
van de Walker
van de Walker

Plate 4

Medium sized mound on the second terrace east of Hyde creek, and not far from it. The depression in the center of this is characteristic of nearly all near the creek and lake, and excavation showed the original rectangular fireplace, bordered with flat stones. Like nearly all others it is in open woodland. The extreme width is about 30 feet. A plan of this appears on plate 12.

Plate 4

Plate 5

A larger mound near the north line of the Timmerman farm. This is about 36 feet across from the extreme points of the slope, which is always gentlest near the edge and more abrupt as it approaches the center. This mound is less depressed in the center than most of those on that side of the lake.

Plate 5

Plate 6

A low and small mound on the Timmerman farm, shows the usual formation, but at noonday might be passed unobserved. Early or late in the day its character is clear. Being in the incipient stage it is but 19 feet across.

Plate 6

Plate 7

A low mound, on the same farm as that shown on plate 6, which is but 21 feet across. Though not large it is very symmetric. The central depression is wide and deep.

Plate 7

Plate 8

A fine mound on the Timmerman farm, at the base of a hill. Partly excavated in 1901. This is 33 feet wide and about 5 feet high. There are but few trees near this and it is a prominent object.

Plate 8

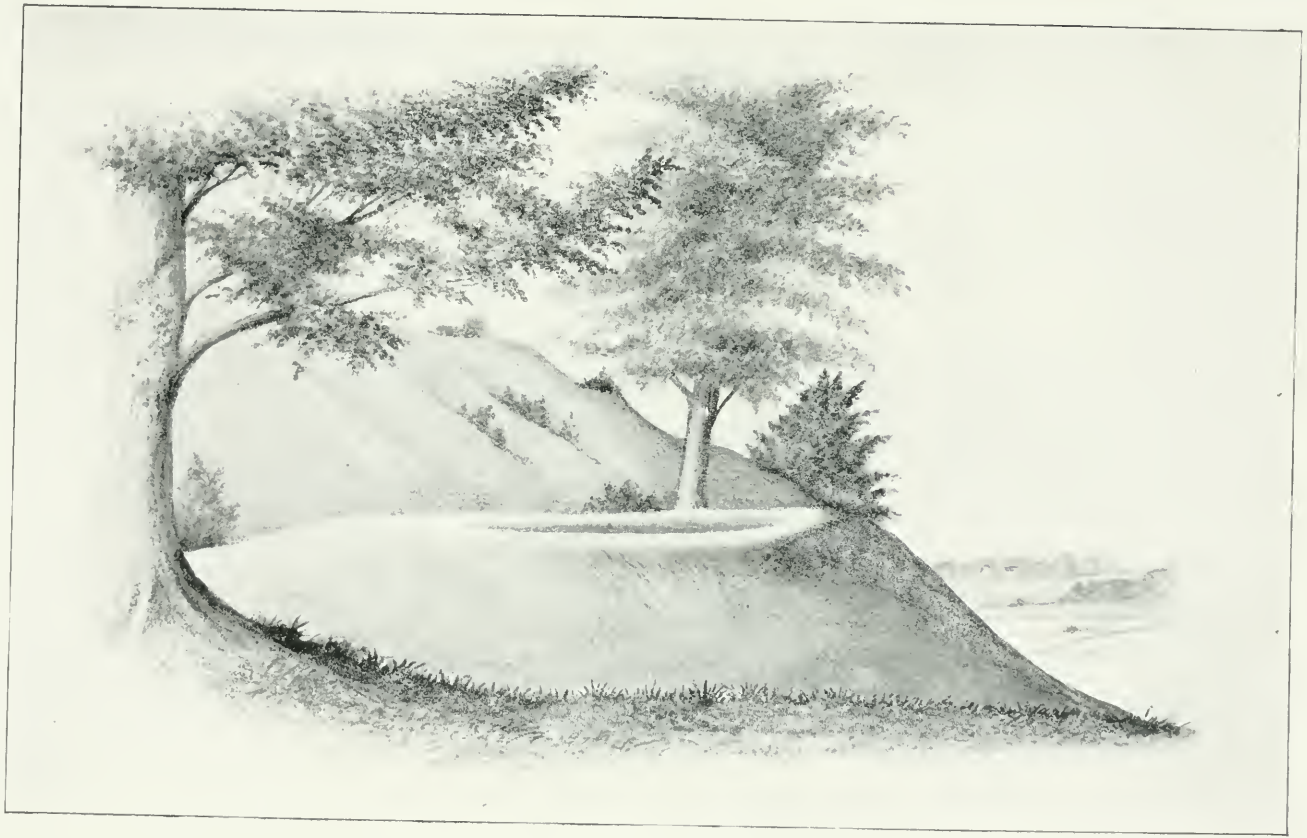


Plate 9

Mound near the ruined La Farge mansion. Another joins it at the base. It is not one of the largest size, but is in open ground on a lower terrace than the house and stands out prominently against the background of the lake. This mound has an extreme width of 34 feet.

Plate 9

Plate 10

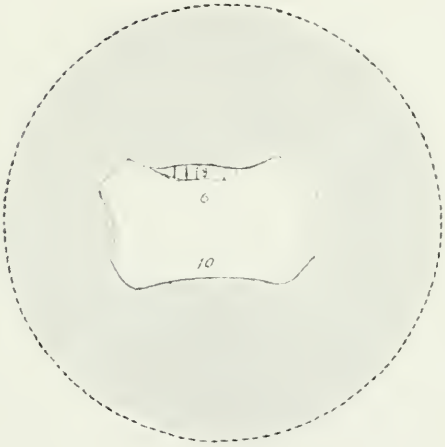
Figure 1 is a sketch, furnished by Harlan I. Smith, being a section of an earth hut of the Thompson River Indians, showing how mounds of this kind are sometimes formed.

Figure 2 is a plan of a mound on the Bay of Quinté, on the north shore of Lake Ontario, and showing a central excavation.

Fig. 3 Section of a mound at the same place, showing the interior filled with stones, the covering of soil and the central depression.

Plate 10

f



2

3

Plate 11

Truncated mound excavated by Dr A. L. Benedict in 1900, on the east side of Cattaraugus creek, N. Y. The upper figure is of the recent condition and probable original form. The plan shows the position of various points of interest reached in excavating. At *A*, were animal bones; at *B*, pieces of Hamilton slate; at *C*, human bones. Mound diameter, 70 feet.

Fig. 2 A mound near the same creek and much like the last. At *A* and *H*, gravel was found; at *F*, a stone fireplace; at *B*, were human bones. There was also charred wood.

Plate 11

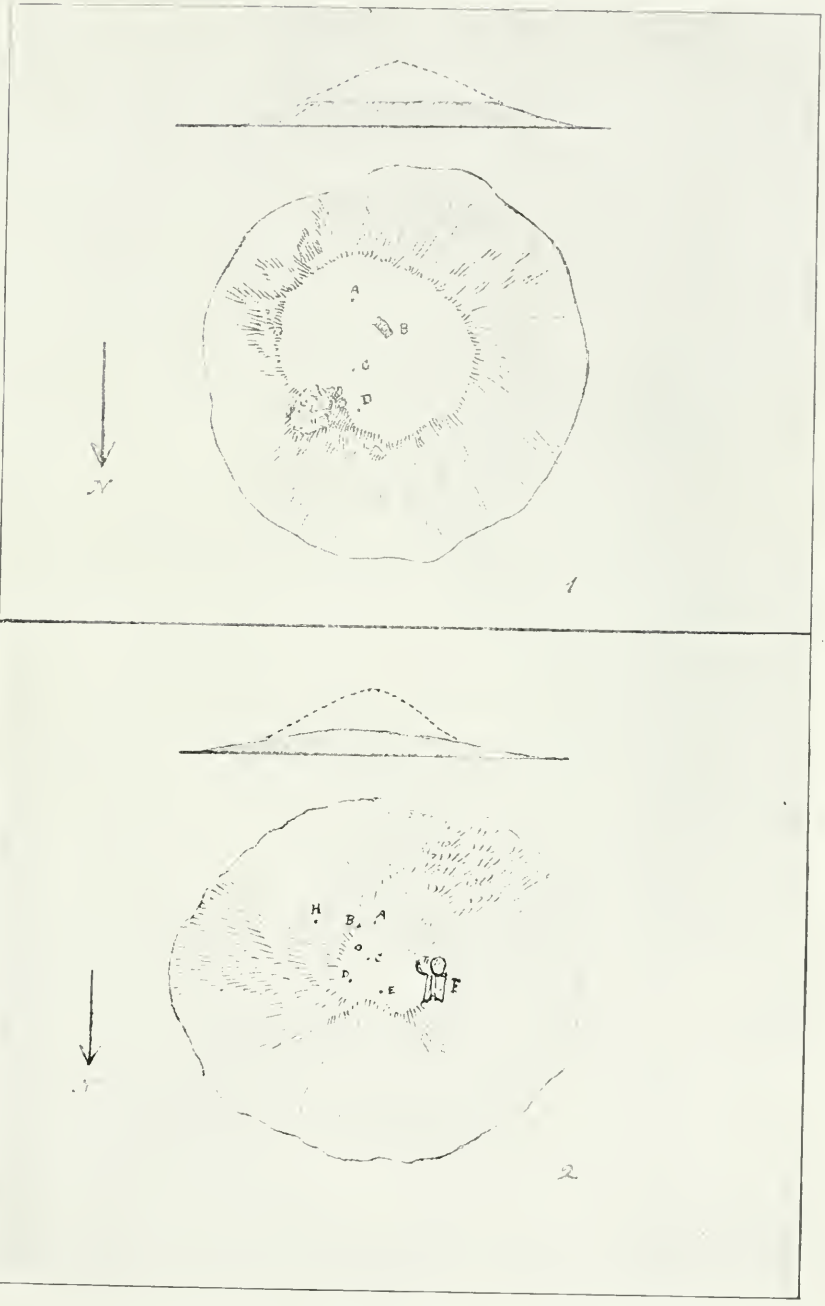
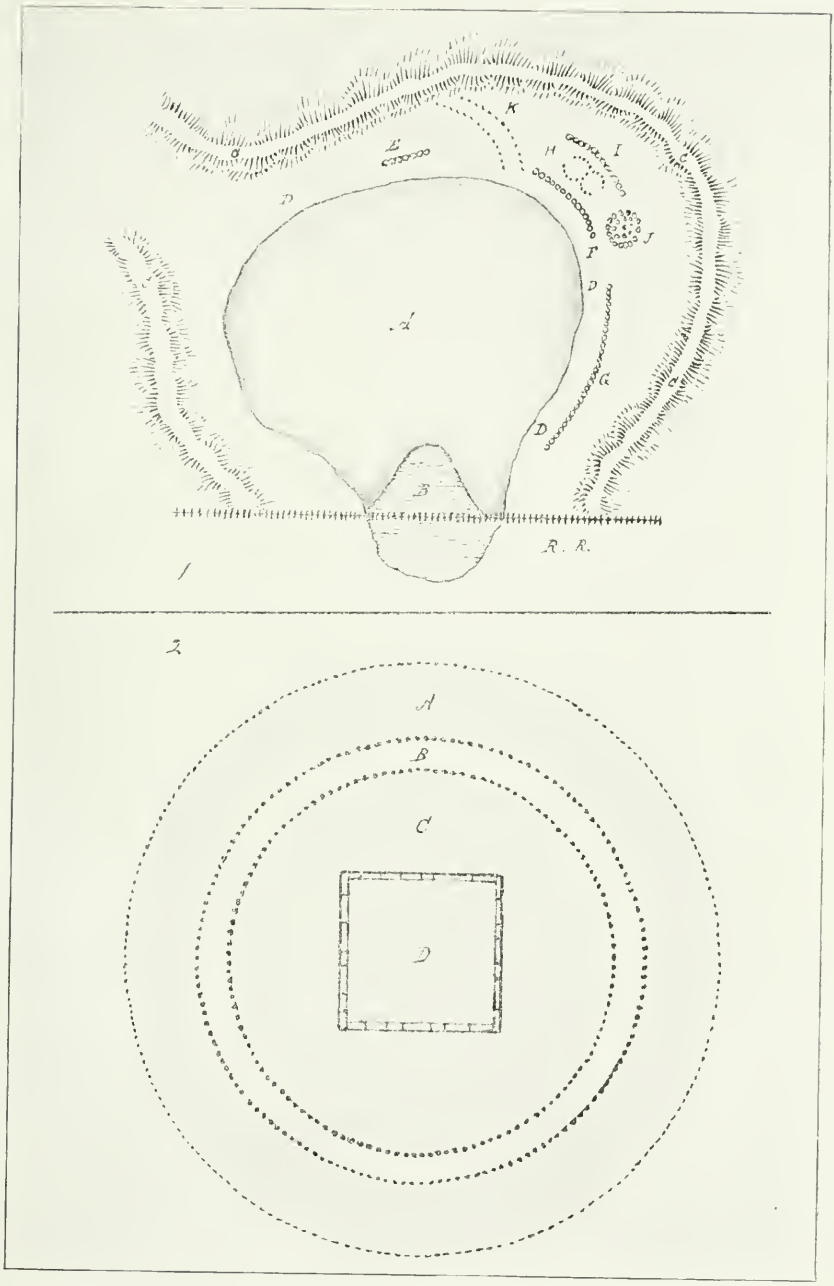


Plate 12

Supposed deer pound by a pond near Unadilla. *A*, is the pond; *C*, moraines; *D*, a road around the pond; *E*, *F*, *G*, *I*, stone walls; *H*, stone circles; *K*, a graded way.

Fig. 2 Plan of a Perch lake mound. *A*, the outer slope; *B*, the crown of the ridge; *C*, the inner slope; *D*, rectangular stone fireplace in the center. This is the ground plan of mound shown on plate 4.

Plate 12



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Bulletin 89

ARCHEOLOGY 11

ABORIGINAL USE OF WOOD IN NEW YORK

BY

WILLIAM M. BEAUCHAMP S.T.D.

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ARCHEOLOGY 11

ABORIGINAL USE OF WOOD
IN
NEW YORK

LIST OF AUTHORITIES

Abbreviations at the left are used in the bulletin in exact reference to works in the following list

Barber and Howe	Barber, J. W. and Howe, Henry. Historical Collections of New York. N. Y. 1841.
Bartram	Bartram, John. Observations on the Inhabitants, Climate, Soil, Rivers, Productions, Animals in Travels from Pensilvania to Onondago, Oswego and Lake Ontario. Lond. 1751. Reprinted in Geneva N. Y. 1895.
Beauchamp	Beauchamp, Rev. W: M. The Iroquois Trail, or Footprints of the Six Nations. Fayetteville N. Y. 1892. This includes David Cusick's Sketches of Ancient History of the Six Nations, with ample notes added.
	——— Iroquois Games. Jour. Am. Folk-lore. Bost. 1896.
Boyle	Boyle, David. Archaeological Report of 1898, being part of Appendix to the Report of the Minister of Education for Ontario. Toronto 1898.
Bruyas	Bruyas, Jacques. Radices Verborum Iroquoeorum. J. G. Shea. N. Y. 1863. Radical words of the Mohawk language. Appendix E, 16th Annual Report of the New York State Museum, Albany 1863. Same paging.
Cammerhoff	Cammerhoff, Frederick. Diary of the Journey of Bro. Cammerhoff and David Zeisberger to the 5 Nations, from May 3–14 to August 6–17, 1750. Mss.
Catlin	Catlin, George. Letters and Notes on the Manners, Customs and Condition of the North American Indians. Lond. 1842.

Champlain — **Champlain, Samuel de.** Oeuvres de Champlain, publiées sous le patronage de l'Université Laval. Par l'Abbé C. H. Laverdiére. Quebec 1870.

Charlevoix — **Charlevoix, P. F. X. de.** Journal of a Voyage to North America; tr. from the French. Lond. 1761.

Clark — **Clark, J. V. H.** Onondaga; or Reminiscences of Earlier and Later Times. Syracuse 1849.

Conover — **Conover, George S.** Journals of the Military Expedition of Major-General John Sullivan against the Six Nations of Indians in 1779. Auburn 1887.

Converse — **Converse,** *Mrs* **Harriet Maxwell.** Iroquois Masks; an illustrated article in a New York city paper of 1899.

Culin — **Culin, Stewart.** Chess and Playing Cards. Wash. 1898.

Dall — **Dall, William H.** On Masks, Labrets, and certain Aboriginal Customs.
In Report of U. S. Bureau of Ethnology, v. 3. Wash. 1884.

Dawson — **Dawson, Sir J. W.** Fossil Men and their Modern Representatives. Lond. 1883.

De Bry — **De Bry, Theodorus.** Admiranda Narratio fida tamen, de Commodis et Incolarum Ritibus Virginiae, etc. Francoforti ad Moenum. 1590.

De la Potherie — **De la Potherie, Bacqueville.** Histoire de l'Amérique Septentrionale. Paris 1722.

De Schweinitz — **De Schweinitz, Edmund.** Life and Times of David Zeisberger. Phil. 1870.

De Vries — **De Vries, David Peter.** Third Voyage of David Peter De Vries to North America. N. Y. Hist. Soc. Collections. Ser. 1, v. 5

Doty — **Doty, L. L.** History of Livingston County. Geneseo 1876.

Gookin — **Gookin, Daniel.** Historical Collections of the Indians in New England. Mass. Hist. Soc. Collections. Bost. 1792.

Hale — **Hale, Horatio.** Iroquois Book of Rites. Library of Aboriginal American Literature, no. 2. Phil. 1883.

Heckewelder — **Heckewelder, J. G. E.** History, Manners and Customs of the Indian Nations who once Inhabited Pennsylvania. Penn. Hist. Soc. Memorials, v. 12. Phil. 1876.

Henry — **Henry, Alexander.** Travels and Adventures in Canada and the Indian Territories. Toronto 1901.

Higgeson — **Higgeson,** *Rev. Mr.* New England's Plantation. 1630. Mass. Hist. Soc. Collections. Bost. 1792.

Hough — Hough, Walter. Primitive American Armor. Wash. 1895.

Josselyn — Josselyn, John. Account of two Voyages to New England; dated in 1675. Bost. 1865. Also in Mass. Hist. Soc. Collections. Ser. 3, v. 3.

Jour. Am. Folk-lore — Journal of American Folk-lore; begun in 1888. Bost.

Kalm — Kalm, Peter. Travels into North America (1749); tr. by J. R. Forster. Lond. 1772.

Ketchum — Ketchum, William. An Authentic and Complete History of Buffalo. Buffalo 1864. Lettered *Buffalo and the Senecas*, and commonly so called.

Lafitau — Lafitau, J. F. Moeurs des Sauvages Amériquains. Paris 1724.

Lahontan — Lahontan, A. L. de D. New Voyages to North America. Lond. 1735.

Loskiel — Loskiel, G. H: History of the Missions of the United Brethren among the Indians in North America; tr. from the German by C. I. La Trobe. Lond. 1794.

McMasters — McMasters, Guy H. History of Steuben County. Bath N. Y. 1853.

Marshe — Marshe, Witham. Journal of the Treaty held with the Six Nations by the Commissioners of Maryland and other Provinces in Lancaster in Pennsylvania, June 1744. Mass. Hist. Soc. Collections. Bost. 1801.

Mason — Mason, Otis T. Primitive Travel and Transportation. Wash. 1896.

Mason, Basketry — ——— Aboriginal American Basketry. Wash.

Mercer — Mercer, Henry C. Light and Fire making. Phil. 1898.

Morgan — Morgan, Lewis H. League of the Ho-de-no-sau-nee, or Iroquois. Rochester. 1851. Quotations are made here from the two volume edition edited by Herbert M. Lloyd. N. Y. 1901.

Morse — Morse, Jedidiah. Geography. 1795.

Moulton — Moulton, Joseph W. History of the State of New York. Pt 2, Novum Belgium. N. Y. 1826.

O'Callaghan — O'Callaghan, E. B. *ed.* Documentary History of the State of New York. O. Alb. 1849-51.

O'Callaghan, Col. Doc. — ——— Documents relating to the Colonial History of the State of New York. Alb. 1853-87.

Penn. Archives — Pennsylvania Archives. New ser. v. 4. Phil.

Pouchot — Pouchot, M. — Memoir upon the Late War in North America between the French and English, 1755–60; tr. and ed. by F. B. Hough. Roxbury Mass. 1866.

Proctor — Proctor, Col. Thomas. Journal of 1791. Pennsylvania Archives. New ser. v. 4. Phil.

Rau — **Rau, Charles.** Prehistoric Fishing in Europe and North America. Wash. 1884.

Relations — **Relations** des Jésuites. Quebec 1858.
Also Burrows' translation. Cleveland O.

Smith — **Smith, De Cost.** Witchcraft and Demonism of the Modern Iroquois.
See Journal of American Folk-lore, Bost. 1888.

Smith, Captain — **Smith, Capt. John.** General Historie of Virginia, New England and the Summer Isles. Lond. 1624. Several editions.

Turner — **Turner, O.** Pioneer History of the Holland Purchase of Western New York. Buffalo 1849.

U. S. Bur. Eth. — **U. S. Bureau of Ethnology.** Reports. Wash.

Van der Donck — **Van der Donck, Adriaen.** Description of the New Netherlands. N. Y. Hist. Soc. Collections, 5:317.

Vanderkemp — **Vanderkemp, Francis Adrian.** Extracts from the Vanderkemp Papers, from the Hudson to Lake Ontario in 1792. Buffalo Hist. Soc.

Watson — **Watson, Elkanah.** Men and Times of the Revolution; or Memoirs of Elkanah Watson. N. Y. 1856.

Williams — **Williams, Roger.** Key into the Language of America. Narragansett Club publications. 1866–74.

Wilson — **Wilson, James Grant.** Arent Van Curler and his Journal of 1634–35. Wash. 1896.

Winne — **Winne, Rev. F. P.** Letter to Rev. Dr Beauchamp.

Wood, Silas — **Wood, Silas.** A Sketch of the First Settlement of the several Towns of Long Island. Brooklyn 1828.

Wood — **Wood, William.** New England Prospect. 1634. Prince Soc. Bost. 1865.

Zeisberger — **Zeisberger, David.** David Zeisberger's and Henry Frey's Journey and Stay in Onondago from April 23d to November 12th, 1753. Mss.

ABORIGINAL USE OF WOOD IN NEW YORK

Fire-making

The aborigines of New York had three means of adapting wood to their use. With fire they felled trees and reduced them to any desired length. With this they hollowed their mortars and canoes, as well as some household utensils. Stone and shell implements aided in this, removing the charred wood. Sand was also used, either as a gritty cutting stone, or in its free and granulated form, aided by water. The use of metals changed all this in most cases, but not in all. For dugout canoes and wooden mortars fire is still employed, chipping and burning following each other.

Fire was obtained in several ways. The simple friction of two dry sticks might produce it, as was often done. The Mohawks called this process *ganniegarannie,* which was an expansion of their own name. There was also an aboriginal tinder used in most cases, called *tă-hah-nyn-ka'-ose* by the Onondagas. Of one kind in Canada we have this account:

> For a wick they have the skin of an eagle's thigh, with the down, which takes fire easily; they strike two pieces of ore together, as we do flint with a piece of iron or steel; in place of matches they make use of a little piece of tinder (it is a piece of wood decayed and very dry, which burns easily and incessantly till it is consumed); having taken fire they put it into some pulverized cedar bark, and blowing gently this bark catches fire. *Relation,* 1634

Another way was by rapidly turning a little cedar stick, but this was a Huron mode, little used by the Algonquins, though in favor with the Iroquois. In his *Light and Fire-making,* Mr H. C. Mercer gives an illustration of the last mentioned method, and also of the mode in use among the Penobscot and Iroquois Indians. His description of the latter follows.

> Make a spindle of hard wood (hickory, cedar) weighted as here, with a flywheel made of strips of bark pegged or sewed together. A wythe bow, with a rawhide string caught at the notch on the spindle top, causes the latter to twirl back and forth as you lift and press the bow. For your hearth, notch against the side of a piece of juniper, pine or cedar, twirling your spindle point at a nick previously made in the wood directly over the notch. In about 20

seconds the drill point smokes, while a brown powder scorched from the fraying wood rises around the revolving spindle end and rolls down the notch. If all goes well this dust should ignite into a spark in about a minute. Blow this against dry punk (a locust tree fungus) and fan the latter into flame against fine vegetable fiber, such as frayed cedar bark, leaves and grass. Thus working you make "wild fire" after the ancient method of the Penobscots (according to the late Chief Joseph Nicolar of Old Town, Maine), Iroquois and Siberian Chuckchis. *Mercer,* p.26

Mr L. H. Morgan gives an account of this in the *League of the Iroquois.* As the new edition of this work embodies some valuable matter heretofore accessible only in the reports of the State Museum, it will be more convenient to refer to this edition. Mr Morgan thus described the *da-ya-ya-da-ga'-nea-ta,* or fire drill.

It consisted of an upright shaft about 4 feet in length, and an inch in diameter, with a small wheel set upon the lower part, to give it momentum. In a notch at the top of the shaft was set a string, attached to a bow about 3 feet in length. The lower point rested upon a block of dry wood, near which are placed small pieces of punk. When ready to use, the string is first coiled around the shaft, by turning it with the hand. The bow is then pulled downwards, thus uncoiling the string, and revolving the shaft towards the left. By the momentum given to the wheel, the string is again coiled up in a reverse manner and the bow again drawn up. The bow is again pulled downwards, and the revolution of the shaft reversed, uncoiling the string, and recoiling it as before. This alternate revolution of the shaft is continued until sparks are emitted from the point where it rests upon the piece of dry wood below. Sparks are produced in a few moments by the intensity of the friction, and ignite the punk, which speedily furnishes a fire. *Morgan,* 2:40

Mr Morgan erred in saying this "was the only method of creating fire known to the red man." The Mohawks rubbed two dry sticks together for this, and used flint for striking fire at a very early day, having their common name of Kanienga from *kanien,* flint. With this is associated the use of this stone in producing sparks, its name being apparently derived from that for fire. From their early possession of the fire steel, perhaps while still in Canada, they adopted it as their national symbol, and were represented by this on the record of the treaty of Fort Stanwix in 1768. In describing the

Iroquois in 1736, the French writer said the Mohawks had for their device a *battefeu* or steel, and a flint.

Mr Morgan has been quoted as though the wheel were of stone, but he did not say this, nor does the figure suggest it. No stone articles have been found in New York which could have had such a use. Figure 5 shows one of these drills. The Onondagas say they once used a slender cylindric stone instead of a stick.

Some stone tools were sharp enough to cut wood, but fire certainly helped much in the coarser work. In small articles flint knives would cut rapidly, though not adapted for a fine finish. It is probable that sandstones or fine sand were used for this. Most antiquarians suppose that the straight grooves made in boulders were for straightening and polishing arrow shafts. They are about the proper size for this and show that sand moved in them in parallel lines. This cuts rapidly when mixed with water. Such boulders, however, for the most part are confined to a limited area in New York, and the requirements of arrow-making may be considered later.

Food

The Indians thought the use of trees as food important. The Adirondack Indians had this name, as equivalent to Tree-eaters, from the Iroquois. To the New England Indians they were known in this way, but Roger Williams seems to have confused them with the Mohawks when he said of them:

> Mihtukme'chakick, *Tree Eaters.* A people so called (living between three and foure hundred miles West into the land) from their eating only *Michtu'chquash,* that is, Trees: They are *Men-eaters,* they eat no corne, but live on the *bark* of *Chesnut* and *Walnut,* and other fine trees; They dry and eat this *bark* with the fat of Beasts, and sometimes of men. *Williams,* ch.2

In his *Description of the New Netherlands,* published in 1653, Adriaen Van der Donck spoke of the same thing: "Our Indians say that they did eat roots, and the bark of trees instead of bread, before the introduction of Indian corn or maize." *Van der Donck,* 5:137. He rarely distinguished between the Iroquois and Algonquins, but his statement belongs to the latter. Other writers have

noticed the same belief, which properly applies only to periods of famine. The northern Algonquins, who cultivated the ground but little, were more frequently in extremity than the settled Iroquois. To the latter *Adirondack* became a term of contempt, implying insufficient food. As in so many other cases, it was not a name which the Adirondacks chose, but one which their foes gave them. The Onondagas still call them *Ha-te-en'-tox,* or Tree-eaters.

Houses

Something might here be said of the various uses to which the Indians put particular trees, but some of these will appear incidentally. One prominent use was that of shelter from the weather and their foes. In summer the Indian went almost naked, and any tree would protect him from the sun. Rainy days were not so comfortable, and the piercing cold of winter made protection necessary for the family of the hardiest hunter. The forest had its gifts to bestow, and thus the favorite cave-dwellings of some lands are almost unknown in New York. Saplings furnished a strong frame; the broad barks of great trees quickly covered them; tough withes bound all together, and the marshes provided soft mats for luxurious repose. For the home of many years, for the sojourn of a single night, there was everywhere abundant material, nor was it sparingly used.

Most early writers have given accounts of these primitive dwellings, of their variety, structure and size and the ease and rapidity with which they were built. There was less national difference than has been asserted. The Algonquin built the long house as well as the Iroquois, though his frequent changes made him partial to a smaller and simpler form. Roger Williams speaks of "*The long poles,* which commonly men get and fix, and then the women cover the house with mats, and line them with embroydered mats which the women make, and call them *Munnotau'bana,* or *Hangings,* which amongst them make as faire a show as Hangings with us." *Williams,* ch.5

These poles might have been for a long house, but the general impression is of a round one. He proceeds to say, "Two Families

will live comfortably and lovingly in a little round house of some fourteen or sixteen foot over, and so more and more families in proportion." The latter expression might refer to a longer house, but he does not mention it. In another place he describes one intended for festival purposes. This was "toward Harvest, when they set up a long house called *Qunnckamuck* Which signifies *Long house,* sometimes an hundred, sometimes two hundred foot long upon a plaine near the Court (which they call *Kitteickañick*) where many thousands, men and women meet." *Williams,* ch.28

Houses probably varied according to the standing of the person, tribe or nation. The Rev. Mr Higgeson gave no flattering account of those in Massachusetts in 1630: "Their houses are verie little and homely, being made with small poles pricked into the ground, and so bended and fastned at the tops, and on the sides they are matted with boughs and covered on the roof with sedge and old mats." *Higgeson,* 1:123

This is quite different from the account in *New England Prospect,* which follows:

Their employments be many: First their building of houses, whose frames are formed like our garden-arbours, something more round, very strong and handsome, covered with close-wrought mats of their owne weaveing, which deny entrance to any drop of raine, though it come both fierce and long, neither can the piercing North winde, finde a crannie, through which he can conveigh his cooling breath, they be warmer than our *English* houses; at the top is a square hole for the smoakes evacuation, which in rainy weather is covered with a pluver: these bee such smoakie dwellings, that when there is good fires, they are not able to stand upright, but lie all along under the smoake, never using any stooles or chaires, it being as rare to see an Indian sit on a stoole at home, as it is strange to see an *English* man sit on his heels abroad. Their houses are smaller in the Summer, when their families be dispersed, by reason of heate and occasions. In Winter they make some fiftie or three-score foote long, fortie or fiftie men being inmates under one roofe. *Wood,* ch.19

This clearly shows that the long house was not confined to the Iroquois family, as some have supposed. The covering with mats, instead of bark, may be noted. This was from the comparative scarcity of large timber near the sea coast. The above description

may be applied to the houses on Long Island, where the same conditions existed, and where the Indians were in subjection to those of New England. Mr Silas Wood said:

At the time of the first settlement of Long-Island, it appears that the western part of it, if not the whole, was in a great measure bare of timber. The Indians here, as everywhere else where they were settled, annually burnt over the woods in order to clear the land, to provide food for the deer and other game. There are numerous facts to prove that, at the time of the first settlement of the Island, the woods were destitute of underbrush, and that the large trees were so scarce that it was deemed necessary to take measures for their preservation. *Wood, Silas,* 3

When the Dutch attacked an Indian village northwest of Greenwich (then in New York) in 1644, it is said that the houses were in "three rows set up street fashion, each Eighty paces long." In the burning of these long houses 500 Indians perished. The long house mentioned far up the Hudson river, at the time of its discovery, was evidently outside of the Iroquois territory. It was of bark, and in it lived 40 men and 17 women, with their chief. It also contained a large store of provisions. This has been located in various places from Catskill to Albany, but always in the Mahican lands.

There is a good description of the building of a Canadian Algonquin lodge in the Relation of 1611, with a reference to the difference there of the summer and winter lodge noted in New England:

The women go to the woods, and bring away poles, and place the base around the fire in a circle, and above fork them together like a pyramid, in such a manner that they rest one against the other directly above the fire, for there is the chimney. Upon the poles they throw skins, or else mats, or pieces of bark; at the foot of the poles, under the skins, are placed the sacks. The whole place around the fire is strewn with pine leaves, in order not to feel the dampness of the ground; above the fir leaves are often thrown mats, or the skins of sea wolves, as delicate as velvet. On this they stretch themselves around the fire, having their heads upon the sacks. . . In summer their lodges change in form: for they make them large and long, in order to have more air: so they cover them with pieces of bark or mats made with tender reeds, and which are much more thin and delicate than ours of straw, so artistically woven that when they are suspended the water rolls over them all their length without penetrating. *Relation,* 1611

This reverses the order in *New England Prospect,* where the winter house is largest. In fact, the New England writers differ much in many things. Daniel Gookin wrote of the Indians there in 1674, and described their dancing houses, such as Roger Williams saw:

> These houses are of various sizes, according to their activity and abilities; some 20, some 40 feet long and broad. Some I have seen of 60 or 100 feet long, and 30 broad . . . In the greater houses they make two, three, or four fires, at a distance one from another. *Gookin,* p.150

They also had raised couches, 7 to 8 feet broad, along the sides. This account may be compared with a plan of the Iroquois long house.

Loskiel wrote late in the 18th century, and is made responsible for the common statement that the circular lodge is not Iroquois, while the long house is characteristic of that family. His words do not quite bear out the inference made. He said:

> The difference in the huts of the Delawares and Iroquois consists in the form of the roofs, the former being angular, and the latter round or arched. The Delaware families prefer living separately, and their houses therefore are but small, but the Iroquois build long houses, with three or four fireplaces, for as many families, who are related and live together. *Loskiel,* 1:53

He described the building of a bark house, for which basswood was preferred. The bark was cut from 6 feet to 9 feet long and laid under stones to make it flat. The frame was of poles, strengthened by crossbeams and covered within and without with bark, sewed on with hickory cord. The roof was ridged and covered with bark. There was an opening in the side for an entrance, and one in the roof for a chimney. Sliding shutters on the sides were the windows, and the fireplace was in the center. Benches along the sides served for tables and bedsteads, and provisions were placed overhead. Champlain had windows in his figure.

As Van der Donck was conversant with both the Iroquois and Algonquins, his description of houses does not determine between these, but probably belongs to the former or both. He said:

> Sometimes they build their houses about 100 feet long; but never more than 20 feet wide. When they build a house,

they place long slender saplings in the ground, having the bark stripped off, in a straight line of two rows, as far asunder as they intend the breadth of the house to be, and continue the rows as far as it is intended the length shall be. Those sapling poles are bent over toward each other in the form of an arch, and secured together, having the appearance of a garden arbor. The sapling poles are then crossed with split poles in the form of lathing, which are well fastened to the upright work. The lathings are heaviest near the ground. A space of about a foot wide is left open in the crown of the arch. For covering they use the bark of ash, chestnut, and other trees, which they pull off in pieces of about six feet long, and as broad as they can. They cover their house, laying the smooth side inwards, leaving an open space of about a foot wide in the crown, to let out the smoke. They lap the side edges and ends over each other, having regard to the shrinkage of the bark, securing the covering with withes to the lathings. . . They have one door in the centre of the house. When the bark of the ash and chestnut trees is not loose, they have recourse to the timber trees, which grow along the brooks, the bark of which can be taken off during the whole summer season. They kindle and keep their fires in the middle of their houses, from one end to the other, and the opening in the roof lets out the smoke. From 16 to 18 families frequently dwell in one house according to its size. *A. Van der Donck,* 5:196

He adds elsewhere:

In their castles they frequently have 20 or 30 houses. We have measured their houses, and found some of them to be 180 yards long, and as narrow as before stated. In those places they crowd an astonishing number of persons, and it is surprising to see them out in open day.

There must be an error in this extravagant estimate of 540 feet. In the *Description of New Netherland* by Arnoldus Montanus, published in 1671 and evidently taken from this, it is called 180 feet instead of yards.

In 1635 the French missionaries among the Hurons compared their houses to garden arbors:

Some are covered with great pieces of ash bark, of elm, and of fir or spruce; and though those of cedar are the best, according to the most common advice and use, there is yet this inconvenience, that they are almost as susceptible to fire as matches . . . These cabins or arbors are of different sizes; some are 2 fathoms in length, others are 10, others 20, 30 and 40; the ordinary width is about four fathoms, the height is almost the same. There are no different stories. *Relation,* 1635

In 1634, Arent Van Curler (Corlaer) visited the Mohawks and Oneidas. In the first Mohawk castle, he said:

There stood but 36 houses, in rows like streets, so that we could pass nicely. The houses are made and covered with bark of trees, and mostly are flat at the top. Some are 100, 90, or 80 paces long, and 22 and 23 feet high. There were some inside doors of hewn boards, furnished with iron hinges . . . The houses were full of corn that they lay in store, and we saw maize; yes, in some of the houses more than 300 bushels. *Wilson,* p.87

In another castle were " 16 houses, 50, 60, 70 or 80 paces long, and one of 16 paces, and one of 5 paces, containing a bear to be fattened." Another had " 32 houses, like the other ones. Some were 100, 90 or 80 paces long; in every house we saw four, five, or six fireplaces where cooking went on. *Wilson,* p.89

In the fourth castle, called Tenotoge, were " 55 houses, some 100 and other ones more or less paces long." The hight of these houses, as reported, agrees with the Huron houses of the same year. At Oneida his estimates were higher: " There are 66 houses, but much better, higher, and more finished than all the others we saw. A good many houses had wooden fronts that are painted with all sorts of beasts. There they sleep mostly on elevated boards, more than any other savages." *Wilson,* p.93

In the Greenhalgh journal of 1677 large Seneca houses are mentioned. Tiotohatton contained " about 120 houses, being ye largest of all the houses wee saw, ye ordinary being 50 or 60 foot long with 12 or 13 fires in one house." This makes the fires very close.

It must be confessed that arithmetical results hardly harmonize with these statements in Greenhalgh. He estimates that there were 324 houses for 1000 Seneca warriors, an average of a little over three to a house. This would give from 12 to 15 inmates to each. The 100 Cayuga houses had 300 warriors; the 164 Onondaga cabins had 350 fighting men; not much over two to a house. The Oneida ratio was still less, or 100 houses for 200 warriors. For the 300 Mohawk braves there were about 96 houses. From these figures it is plain that the numbers in any large house imply a decrease in others, and that very many lived in cabins intended for a single family. A careful reading of some early journals shows this to have been the case. Field cabins often had but one or two tenants among the Onondagas.

John Bartram's account of the Onondaga council house in 1743 may be quoted, and his plan and elevation are reproduced in figure 9. It should be remembered that this was not a dwelling house. He was at Onondaga with Conrad Weiser and Lewis Evans, having come by way of Owego. He said:

They shew'd us where to lay our baggage, and repose ourselves during our stay with them; which was in the two end apartments of this large house. The *Indians* that came with us were placed over against us; this cabin is about 80 feet long, and 17 broad, the common passage 6 feet wide; and the apartments on each side 5 feet, raised a foot above the passage by a long sapling hewed square, and fitted with joists that go from it to the back of the house; on these joists they lay large pieces of bark, and on extraordinary occasions spread matts made of rushes, this favour we had; on these floors they set or lye down every one as he will, the apartments are divided from each other by boards or bark, 6 or 7 foot long, from the lower floor to the upper, on which they put their lumber, when they have eaten their homony, as they set in each apartment before the fire, they can put the bowel over head, having not above 5 foot to reach; they set on the floor sometimes at each end, but mostly at one; they have a shed to put their wood into in the winter, or in the summer to converse or play, that has a door to the south; all the sides and roof of the cabin is made of bark, bound fast to poles set in the ground, and bent round on the top, or set aflat, for the roof as we set our rafters; over each fireplace they leave a hole to let out the smoak, which in rainy weather, they cover with a piece of bark, and this they can easily reach with a pole to push it on one side or quite over the hole, after this model are most of their cabins built. *Bartram,* p.40

When the Rev. Samuel Kirkland was at Onondaga in 1764, he said the council house was about 80 feet long and had four fires. The Seneca council house was of the same size. In Bartram's plan the apartments would be about 5 by 7 feet, with a hight of 18 feet for the cabin. For sleeping there was sometimes a second tier, and the lodgers lay as in the berths of a ship.

In later days the long dwelling house was shortened, and it was eventually displaced by the cabin of squared logs, now giving way to modern framed houses. Mr Morgan was able to secure traditional accounts of the early houses, and of the later ones of bark. Some minor particulars of this kind the writer has had from the Onondagas.

The bark house is called *ka-no'-sa* by the Onondagas, *gä-no'-sote* by the Senecas. The Onondaga word for council house is *a-hus-hah-tuk'-wah.* A single house, according to Mr Morgan, was about 20 by 15 feet square, and of the same hight. The frame was of five upright poles at the sides and four at each end. In his plan these were simply forked at the top, not bent over as in early days. Cross poles in these forks made a plate to which the rafters and poles were firmly attached, strengthened by other transverse poles. This frame was shingled with broad pieces of ash or elm bark, stitched to the poles. An outer frame made these more secure. The fire was in the center, and there was a door at each end, over one of which the clan totem was cut. The platform within was 2 feet from the ground, and there was another 5 feet above. Various articles were kept overhead. This varies much from earlier accounts, but modes of life had changed. Figures are given of the bark house from several sources.

To the above may be added something from Charlevoix, though his statements are usually second hand:

When the floor happens not to be large enough for bedding for all the persons in the family, the young folks have their beds on a kind of loft, five or six feet from the ground, and which runs the whole length of the cabbin; the household furniture and provisions are placed above that on shelfs laid crossways next the roof. There is commonly before the entry, a sort of vestibule or lobby where the youth sleep in summer-time, and which serves as a repository for wood in the winter. The doors are only so many pieces of bark, suspended from the top like the ports of a ship . . . Every village has a pretty large square, but these are seldom regular. Formerly the Iroquois built their cabbins in a better manner than the other nations, and even than themselves do at this day; these were adorned with figures in relievo, but of very coarse workmanship; and as almost all their towns have been since burned in different expeditions, they have not taken the trouble to rebuild them with their former magnificence. *Charlevoix,* 2:127–28

Figure 14 shows Morgan's idea of a modern Seneca bark house of a small size, with a kind of double frame, small poles being placed outside to retain the bark in place. It has not the rounded roof, almost flat above, of the early Iroquois. Figure 18 from Colonel

Romer's map of 1700 shows both kinds of roof, but this may be a fancy of the draftsman. Figure 16 is Morgan's picture of an Iroquois long house with five fires. This has also the modern roof and not the early one. Figure 19 is from a map attached to a petition of the Schoharie Indians, regarding some land stolen from them in 1734. The petition was addressed to the governor of the province of New York. The wigwam has an angular roof, an opening for smoke, and two doors in the side, another modern feature, but Cammerhoff said, in 1750, that the Cayuga cabins had "small entrance buildings on both sides." He may have meant ends. Figure 15 is from Morgan's plan of the interior of a bark house, showing the berths.

Mr Herbert M. Lloyd, in editing the new edition of the *League of the Iroquois,* adds some valuable notes on the long house, with a translation of Lafitau's description of one, perhaps the fullest in detail ever published. Like all progressive observers, Mr Morgan was not always consistent with himself, and Mr Lloyd judiciously points out the reasons for this, ending with a new plan founded on Lafitau's description. This makes the apartments longer, gives a wider space in the center, and has storerooms for barrels, as well as bunks for children. It is the most satisfactory plan yet published, but the essential differences are in the greater width of the building and the larger rooms on each side.

Lafitau's account may be summarized here. The cabins were from 30 feet to 36 feet wide and high in proportion, having vaulted roofs. A cabin with a single fire was from 30 feet to 40 feet long, adding 20 feet to 25 feet for each additional fire. The rounded roof was made of poles fastened to the square frame below. Along each side was a low platform, and above this another about 13 feet long, 5 or 6 feet wide, and as many high. These spaces were inclosed on all sides but one and served as beds. The bark shelves above served for storage, and at intervals below were places for large chests of corn. A vestibule at each end served for storage or sleeping, and the doors of these were doubled in winter to keep out the cold. There was an outside frame to protect the bark. Mr Lloyd says: "The roof of the main house was usually a round arch, but

sometimes made with straight rafters like our own. In either form it was probably too steep for a resting-place, but onto the flatter roof of the vestibule people climbed to see the sights." *Morgan,* 2:299

Those familiar with Catlin's pictures of Mandan lodges will remember the Indians seated on them, and the curve of the roof differs little from that of the Iroquois lodge. In the latter the outer framework not only aided in climbing, but afforded a secure foothold when once on the roof. So we find this a favorite spot. When Chaumonot entered Onondaga in 1655 he found the roofs covered with children. At Le Moyne's entrance in 1661 the town was scarcely visible, "the pickets, the cabins and the trees were so covered with people." When Bartram was at Tueyahdassoo in 1743, "all the *Indians,* men, women and children came to gaze at us and our horses, the little boys and girls climbed on the roofs of their cabins, about 10 in number, to enjoy a fuller view." *Bartram,* p.40

A severer test came at other times. At the dream feast at Onondaga in 1656, Garakontie"s brother, it is said, "in the sequel mounts upon the roof, he makes a thousand turns there, crying as though all had been lost. This done he descends, going gravely through all the town." *Relation,* 1656

Indoors the Hurons played the game of the bowl, village against village. "All this company crowds into one cabin, and arranges itself on the one side and the other upon poles raised even to the top." *Relation,* 1636

Among the Hurons torture took place in the great war captain's cabin.

> So it is called *Otinontsiskiaj ondaon,* that is to say, the house of the heads cut off. It is there where all the councils of war are held: for the cabin where the affairs of the country are considered, and which regards the polity only, is called *Endionrra ondaon,* the council house . . . The old men placed themselves above, as upon a sort of scaffolds which run above on both sides the whole length of the cabins; the young people were below, but so much crowded that they were almost one upon another, so that there was scarcely passage there along the fires. *Relation,* 1637

Figure 23 is a section of the typical early Iroquois cabin. *aa:* Side posts in rows and arched over at the top, united at *b,* where they are naturally thinner. With rare exceptions eastern aboriginal roofs had this curve, being nearly flat above. The huts of travel were different. *cc:* Posts each side of the passageway, usually carried to the roof. At intersections all were bound together. *dd:* The first floor of joists and bark for sitting or sleeping. The hearths were in the midst of the ground floor. *ee:* The second shelf, used for children when needed and for sitting or storing at other times. This is the *endicha* or *andichon* of the Mohawks and Hurons, meaning an elevated place. In playing a Huron game we are told:

> Each party ranges itself one or the other side of the cabin, filling it from top to bottom, under and above the andichons, which are of bark and made like a bed canopy or roof, corresponding to that below fastened to the ground, on which they sleep at night. They place themselves on the poles that lie and are suspended along the length of the cabin. *Relation,* 1639

Upper shelf reached by a ladder, useful for spectators and storage, marked *f.* This shelf or any other is called *wen-ne-sa'-ka* by the Onondagas. The frame was covered with bark and the door usually hung from above.

Morgan's communal theory of the Iroquois house was carried too far. Greenhalgh mentioned the long house, but gave an average of two or three warriors to a cabin. Probably half had not more than one. The houses of chiefs were usually larger than the rest, as hospitality was one of their official duties. When Cammerhoff came to Onondaga in 1750, he said, "At last we reached the house of Ganassateco. There is a large pole before it with an English flag on it. The house is very large and roomy, and well built." A large room was given them. This was not the council house. At Geneseo, he said, "The old chief came to us and wanted to converse. He said that his house was the largest in the town, and the meeting place for the council."

When Father Le Moyne first visited Onondaga in 1654, he lodged in the cabin "of the first captain of the country," a spacious building. Next year Chaumonot spoke of this chief's house as "a great cabin

which had been prepared for us." Similar notes follow. Mr Morgan's conclusion therefore is hardly sound, that "Indian chiefs were housed with the people, and no better than the poorest of them." The distinctions between the rich and poor Iroquois were great. Land was not held altogether in common, and food was quite as much property as anything else. Even hunting and fishing privileges were regulated. The writer has elsewhere pointed out some of the weak points of this distinguished ethnologist's arguments, but the building feature alone is in line with the purpose of this paper.

Nearly all early accounts of permanent circular lodges represent them as round-topped. Figure 26 is from one of Champlain's plates. Figure 25 shows the frame of a similar lodge. Poles were placed in a circle, the tops bent over and bound together, and on these bark was laid or mats were spread.

At first Iroquois villages were removed every 10 or 15 years, but more rarely afterward. In the first half of the 17th century the Onondagas occupied five different sites, but remained on Indian hill, Pompey, at least 30 years. In 1681 they left that spot and went to Butternut creek. Writing from Onondaga, Aug. 25, 1682, Father Jean de Lamberville said:

> On my arrival here I found the Iroquois of this village occupied in transporting their corn, their effects and their cabins to a place 2 leagues distant from their former residence, where they had dwelt for 19 years. They make this change in order to have there their firewood in convenient proximity, and to secure fields more fertile than those that were abandoned. This is not done without difficulty . . . A single family will hire sometimes 80 or 100 persons; and these are in turn obliged to render the same service for those who may require it from them. *Relation,* 1683

The Onondagas were 10 years longer than this at Indian hill, but the so called castle, a mile west, probably represented the shorter term, and the Christian Indians seem to have congregated there. The transportation of cabins 6 miles is the point to which attention is now directed. This seems to refer merely to those parts on which much work had been expended, like the carved or painted fronts. Bark and frames were had on the new site.

The Minquas of the Dutch were called Andastoes by the Hurons, and Andastoguez by the Iroquois, the latter name probably referring to their style of building. On the map of Creuxius they appear as "*Andastoeii, seu perticarum.*" Mr J. G. Shea defines the name as *cabin poles.* The Mohawk word, *gannasta,* is poles for making a cabin. He sustains this by quoting an early Huron vocabulary, where *andasta* is "perche à faire la voûte de la cabane," i. e., pole to make the roof of a cabin. It probably referred to a variation from Huron and Iroquois architecture. *Andastogue* survives as Conestoga.

From the long house came the name by which the Iroquois called their confederacy. It would be aside from the present purpose to discuss their other names, their origin and meaning, often curiously misconceived, but this one belongs to the question of habitation, and is illustrated by it.

From the Onondagas the writer had for this the name *Ka-no-se-o'-ne,* often written *Konosioni,* a house made of several houses or families put together; or more simply, *ka-no'-sa,* house; *onwe,* real or original; in both cases referring to the kind of house formerly used. Symbolically this house extended from the Schoharie to the Genesee valley, inclusive, the Mohawks being the east door, the Senecas the west, the council fire burning in the center at Onondaga. It was a long house indeed, with its five family fires.

The Relation of 1654 said that "the Iroquois had always called themselves *Hotinnonchiendi,* that is to say, the finished cabin, as if they were only one family." In that of 1660, the French had heard "that the next year will be more formidable than the preceding, because all the cabin—it is thus they speak to express the five Iroquois nations," were to unite in the war. In commenting on a French letter in 1694, the Rev. Mr Dellius said "*Honontonchionni* I think do's signify as much as *Konossioni,* which is the whole house, or all the Indians together." A little earlier Father Bruyas gave *hotinnonsioni* as the Mohawk word for makers of cabins, and *gannonses* for a long house in the ordinary sense. A note to Montcalm's letter of Ap. 24, 1757, says that the Iroquois "compose only one single house, which is called the Iroquois Cabin, or the Grand Village."

In his curious history David Cusick gave the name as *Goo-nea-seah-ne,* i. e. a long house. Charlevoix called the Iroquois *Agonnonsionni,* or cabin-makers. The Moravian writers persistently defined *Acquanushioony* as confederates or covenant people, and De Schweinitz fell into a curious error on this point. He said:

Aquanoschioni was one of their original names, and Hodenosaunee, or "People of the Long House," another. It has been maintained that Aquanoschioni is a corruption of Hodenosaunee, and that they did not themselves make use of it. But the latter assertion is disproved by facts. In all the many negotiations which Zeisberger carried on with their Grand Council they invariably employed the name Aquanoschioni when speaking of themselves, as his journals abundantly show. Lafitau and Charlevoix, two Jesuit missionaries, translate it "House-Makers." *De Schweinitz,* p.32

The names are one, and the differences those of dialect. Mr Horatio Hale alone said of this word: "The people of the confederacy were known as *Rotinonsionni,* 'They of the extended house.' In the Seneca dialect this was altered and abridged, to Hotinonsoñni, the ñ having the French nasal sound. This word is written by Mr Morgan, *Hodenosaunee.*" *Hale,* p.76

Mr Morgan's name and definition have a wide use, though varying from earlier authorities. He said:

After the formation of the League, the Iroquois called themselves the *Ho-de-no-sau-nee,* which signifies "the people of the long house." It grew out of the circumstance that they likened their confederacy to a long house, having partitions and separate fires, after their ancient method of building houses, within which the several nations were sheltered under a common roof. Among themselves they never had any other name. *Morgan,* 1:48

For building or repairing these bark houses, bark was taken from the trees at the best time, and kept in water till needed. The pieces were thus preserved from warping and cracking. Butternut creek, near the Onondaga fort of 1696, had its name from this, *ka-soon'-tah* meaning bark, or more largely, bark in the water. For a temporary shelter bark was commonly used. John Bartram gives an account of this in describing his Onondaga journey in 1743:

They cut the tree round through the bark near the root, and make the like incision above 7 feet above it, these horizontal ones are joined by a perpendicular cut, on each side of which they after

loosen the bark from the wood, and hewing a pole at the small end, gradually tapering like a wedge about 2 feet, they force it in till they have compleated the separation all round, and the bark parts whole from the tree, one of which, a foot diameter, yields a piece 7 feet long and above 3 wide: And having now prepared four forked sticks, they are set into the ground, the longer in front; on these they lay the cross-poles, and on them the bark. This makes a good tight shelter in warm weather. *Bartram,* p.20

Father Bruyas mentioned the andichon twice. Brébeuf described it in the house built for him and his friends in the Huron country, in 1635. "At the two sides, according to the Huron fashion, are two benches, which they name *endicha,* upon which are the chests to put our clothes in, and other little commodities." These suggest the berths so often described, and which were continued in the log cabins. Thus in Dr Jabez Campfield's account of Seneca houses in 1779, he said: "Most of their houses have a small additional place, built at one end, from which, they have a dore into ye large house—they build two tier of births one above the other, on both sides, and have fire in ye centre." *Conover,* p.60

Bishop Cammerhoff mentioned these outside apartments, when at Cayuga in 1750. "There are about 20 huts all together, most of them large and roomy, with 3 or 4 fireplaces; they are well built and water proof. I have not seen as good huts anywhere else. They have small entrance buildings on both sides, and four or five families can lodge in every cabin." It was the first village he had seen in the early Iroquois country. A little later he was in the Seneca town of Ganataqueh (Canandaigua). "The huts were ornamented with red paintings of deer, turtles, bears, etc., designating to what clan the inmates belonged." *Cammerhoff*

This feature has been mentioned before at Oneida, and was common among the Iroquois, pointing out to visitors their kindred clans, on which they had a direct claim. In the French account of Iroquois customs in 1666, we are told that war councils are held in the cabin of a war chief, and others in that of a principal chief. "Each tribe has in the gable end of its cabin, the animal of the tribe painted; some in black, others in red. When they assemble together for consultation, the first Division ranges itself on one side

of the fire in a cabin; and the other Division places itself on the other side." *O'Callaghan,* 1:4

Van der Donck refers to something different, and perhaps Algonquin:

We have seen some counterfeit representations of trumpets in their strong houses or castles, wherein they hold their council assemblies, but their paintings are not spirited and ingenious. They also paint their shields, and war hammers or clubs, and in their houses on the rail-work, they paint representations of canoes and animals, which are not well done. *Van der Donck,* 5:164

If this writer had indeed been in Mohawk towns and seen their long houses, it is curious that he should have passed over so plain and common a feature in speaking of house paintings.

Heckewelder seems to refer to the painting of these house totems as a general custom:

The Indians, in their hours of leisure, paint their different marks or badges on the doors of their respective houses, that those who pass by may know to which tribe the inhabitants belong. Those marks also serve them for signatures to treaties and other documents. *Heckewelder,* p.254

One superstitious custom, connected with cabins, seems to have been quite general. It was not so singular as one of the Canadian Algonquins, of a kindred nature. When an inmate died among these, they lifted the bark above the spot, that the soul might pass out of the cabin, but some thought it found its way through the chimney or other opening above. Sometimes they hastened it by beating on the cabin with sticks. This was called *gannitenton* by the early Mohawks. In 1655 an Erie girl was killed at Onondaga:

Towards evening the murderer, or some one else, had it cried aloud through the streets and by the cabins that such a person had been put to death. Then every one began to make a noise with his feet and hands; some, with sticks, struck upon the barks of the cabins to frighten the soul of the deceased, and to drive it far away. *Relation,* 1656

Wentworth Greenhalgh saw a similar scene at the Seneca town of Tiotohatton in 1677. Several prisoners had been put to death. "Att night we heard a great noyse as if y^{e} houses had all fallen, butt itt was onely ye Inhabitants driving away y^{e} ghosts of y^{e} murthered." *O'Callaghan,* 1:13

This beating of cabins served other purposes. Among the Hurons, in 1637, there was a deadly pestilence, from which the host of the French desired to be free. After a sacrifice of tobacco at night, there followed "a hubbub and charivari, which was made by all in the cabin for a quarter of an hour. They struck so rudely against the barks that it was impossible to hear each other. This was to make the pestilence afraid." The same custom was found in Illinois, and it was probably a general one.

Forts

In times of peace towns were often defenseless. When war came, the wooden walls were repaired or new ones made, strong enough for aboriginal warfare but not always safe against the white man's arms. That earthworks were often picketed is now definitely known, and some principles of their construction are understood, enough to call forth admiration.

The earliest fort in this region of which we have any contemporaneous description was that visited by Jacques Cartier in 1535. There is little cause to doubt that this was occupied by the early Mohawks, though on the site of Montreal. The following brief account is part of Hakluyt's translation, quoted by Sir J. W. Dawson:

> The citie of Hochelaga is round, compassed about with timber, with three course of Rampires, one within another framed like a sharp spire, or pyramid, but laid acrosse above. The middle-most of them is perpendicular. The Rampires are framed and fashioned with pieces of timber, layd along very well and cunningly joyned together after their fashion. This inclosure is in height about two rods. It hath but one gate or entrie thereat, which is shut with piles, stakes, and barres. Over it, and also in many places of the wall, there is a kind of gallerie to run along, and ladders to get up, all full of stones and pebbles for the defence of it. *Dawson*, p.30

This is the key to the construction of most of the New York palisades. As the gallery was not continuous in this case, Mr Dawson has represented the sections as watchtowers in his ideal view of Hochelaga. They were probably open above. The section of this wall from Ramusio gives only a general idea and one hardly correct. That has two sections of boards like the sloping walls of an A tent, with central poles properly braced. Toward the top

of one slope is a shelf, intended to show the gallery. The real requirements are a line of upright posts, sufficiently far apart to admit the sloping timbers between them at the top. The writer found, in examining one stockaded site a space of 30 inches from center to center of the post holes. If the upright posts in these were each a foot thick there would remain 18 inches for the two intervening and sloping ones, or 9 inches for each. If all were of the same size, they might average 10 inches at the base. Figure 13 will show the middle, perpendicular post, mentioned by Cartier, with the others like a sharp pyramid, laid across above. The gallery can not be so easily shown, but its principle will be readily understood. By the intersection of the three and probable projection of part or the whole, angles were formed above, ready for the reception of riders, running lengthwise of the wall. At the beginning the upright and sloping poles were firmly bound together; the new addition was securely bound to all, adding greatly to the strength of the wall. A line of saplings on either side of the central post would suffice for this. The forest warrior did not stop here. While binding these together and looking on the ground below, he became conscious of the advantage of his position. By binding a few more poles to the projecting posts and securing bark to them, he could have a battlement well worth having. Figure 10 shows a section of one thus made. Accustomed to close encounters, where simple missiles were of use, he might gather stones suitable for casting down on any foe, as he did, for men have used these in every age and clime. The ladders were rude. A notched pole, or one with a few projections, would be all that sailor or Indian would require. Figure 11 is a view, showing the battlements, pickets and the breastwork below.

It will be observed that for a triple stockade of this kind, but one line of post holes was required. The cross poles needed none, and for some stockades no holes at all were used. Passing from Hochelaga, we may consider Van der Donck's account of early fort building in New York:

First they lay along on the ground large logs of wood, and frequently smaller logs upon the lower logs, which serve for the foundation of the work. Then they place strong oak palisades in the

ground on both sides of the foundation, the upper ends of which cross each other and are joined together. In the upper crossing of the palisades they then place the bodies of trees, which makes the work strong and firm. *Van der Donck,* 5:197

This made a double stockade and required no deep holes. Figure 12 shows a section of this form. A shallow trench, or anything to hold the base of the pickets temporarily in position, was all that was needed. The Iroquois favored the double or triple stockade as a rule; but, when they had the white man's tools, it became easier to make a single stockade, as they could then use larger posts and dig deeper holes. So Greenhalgh found some Mohawk towns thus defended in 1677. In 1634 Van Curler mentioned but one stockade among them, that of Tenotoge, the fourth castle or town. Of this he said:

This castle has been surrounded by three rows of palisades, but I did not see anything peculiar about them, but that six or seven pieces were so thick that it was quite a wonder that savages should be able to do that. *Wilson,* p.90

He gave however a good account of the Oneida castle as it appeared that year. He came westward from the lower Mohawk river to that town and said:

We marched boldly to the castle, where the savages opened to let us pass, and so we marched through them by the gate, which was 3½ feet wide, and at the top were standing three big wooden images, of cut wood, like men, and with them I saw three scalps fluttering in the wind, that they had taken from their foes as a token of the truth of their victory. This castle has two gates, one on the east and one on the west side. On the east side a lock of hair [scalp] was also hanging; but this gate was 1½ feet smaller than the other one. . . This castle is situated on a very high hill, and was surrounded with two rows of palisades. It was 767 paces in circumference. *Wilson,* p.93

The most interesting of all the Iroquois forts was the one attacked by Champlain in 1615, and of which he spoke highly, saying it was stronger and better built than those of the Hurons, from which it differed. It was not naturally defended, being on a broad stretch of low land among the hills, and extending into a shallow pond, where holes could not be dug. Perhaps from its accessible position, unusual pains had been taken to strengthen it.

Their village was enclosed with strong quadruple palisades of large timber, thirty feet high, interlocked the one with the other, with an interval of not more than half a foot between them; with galleries in the form of parapets, defended with double pieces of timber, proof against our Arquebuses, and on one side they had a pond with a never failing supply of water, from which proceeded a number of gutters which they had laid along the intermediate space, throwing the water without, and rendered it effectual inside, for the purpose of extinguishing fire. Such was their mode of fortification and defence, which was much stronger than the villages of the Attigouatans [Hurons] and others. *O'Callaghan,* 3:14

Most persons are familiar with the picture of this fort, and it is a good specimen of the vagaries of art. The houses are regularly arranged, and, if long and high, are out of proportion to the size of the fort. That the French and Indians could almost step over the farther walls is of no great consequence, but the palisades can hardly be said to interlock, or to have "an interval of not more than half a foot between them." The parapets are well finished specimens of mechanical art, and the ladders as regular as the steps of a palace. The truth seems to be that this quadruple palisade was made on the plan of the double, the two inner and two outer lines giving it a broader foundation below, and a broader parapet above. It needed no post holes, and the unplowed site shows traces of none. Extending into the shallow pond, the water could not be cut off, and the land afforded a proper grade for the gutters. The fanciful wall of the picture may be dismissed, and for it should be substituted four lines of pickets, crossing above, instead of two or three. That it was ingenious is true, fulfilling every requirement of primitive warfare, but those who built it simply carried their usage a step beyond what others had done.

No account of early forts would be complete without a quotation from the quaint history of David Cusick. He said:

The five families were compelled to make fortifications throughout their respective towns, in order to secure themselves from the devouring monsters. The manner of making the fort: at first they set fire against several trees as requires to make a fort, and the stone axes are used to rub off the coals, as to burn quicker: when the tree burns down they put fires to it about three paces apart and burns it down in half a day; the logs are collected to a place

where they set up round according to the bigness of the fort, and the earth is heaped on both sides. A fort has generally two gates; one for passage, and the other to obtain water. *Beauchamp,* p.14

Three paces is a very moderate hight for a picket intended to be set in the ground. As for the mode, charring and rubbing could be carried on rapidly, and was light work. Changes came with the white man's tools and hints. The single line of thick posts, set close together, grew in favor. The French showed the use of the bastion; the English built forts and blockhouses for the Indians.

Two sketches of early New York forts are given from Van der Donck's map. Fig. 20 shows one of the Mahicans, which is angular and with projecting lines of defense on each side. The other is a circular Minisink fort, drawn in at the gateway, which was a frequent feature. Figure 17 represents this. Both have single open lines of pickets, and the houses are of the usual round-topped style. The arrangement of the pickets differs from his description, and the plan of the forts seems all that is intended. The pickets would not hide the defenders.

There was a change even when the Indians for a time made their own forts. In the Indian war of 1643 the Wetquescheck forts are described as "of plank five inches thick, nine feet high, and braced round with thick plank studded with port holes."

In the *Journal of the second Esopus war,* 1663, there are accounts of two forts built by the River Indians. A squaw described one:

The fort is defended by three rows of palisades and the houses in the fort encircled by thick cleft palisades with port holes in them, and covered with bark of trees; says that the fort is quadrangular but that the Angles are constructed between the first and second rows of palisades and that the third row of palisades stands full eight feet off from the others towards the interior, between the two first rows of palisades and the houses. *O'Callaghan,* 4:49

This was of a mixed character and abandoned, and another found in process of construction was thus described:

The fort was a perfect square with one row of palisades set all round being about fifteen feet above, and three feet under ground. They had already completed two angles of stout palisades, all of them almost as thick as a man's body, having two rows of portholes,

one above the other; and they were busy at the third angle. These angles were constructed so solid and strong as not to be excelled by Christians. *O'Callaghan,* 4:73

A Mohawk fort of 1665 is described as "a triple palisade, surrounding their stronghold, twenty feet in height, and flanked by four bastions." It had "prodigious quantities of provisions," and an abundant supply of water in bark tanks.

The French said that the triple palisade of the Onondagas, burned in August 1696, was built by the English; but there is no documentary evidence of this. It is thus described:

It was an oblong, flanked by four regular bastions. The two rows of stockades that touched each other, were of the thickness of an ordinary mast, and outside, at a distance of six feet, stood another row of much smaller dimensions, but between 40 and 50 feet in hight. *O'Callaghan,* Col. Doc. 9:653

Beside the mission fort of 1656 at Onondaga lake, the French unsuccessfully tried to build a blockhouse at Onondaga in 1711. At the same time Fort Hunter, with its chapel and blockhouses, was built for the Mohawks, and similar buildings were contracted for among the Onondagas. All these were to be garrisoned by white men. In 1756 Sir William Johnson formed a different plan; that of building forts and blockhouses to be used by Indians, and this was partly carried out. Figure 21 is the plan preserved of the one built for the Schoharie Indians, and the others scarcely differed from this. The directions for the one at Onondaga may be read with this in hand, and part of these follow:

Fort is to be one hundred & fifty feet square, the Logs to be either Pine or Oak sixteen feet long, four feet of which to be set in the ground well rammed and pounded t[w]o sides of each Log to be square so as they may stand close to each other proper Loop holes to be cut at four feet distance the height from the Ground to be left to the Indians, two good Block Houses to be built at either Gate of the opposite Corners each Block House to be 24 feet square below the upper part above the beams to project a foot so as men may fire down upon the enemy. You are to floor the Block Houses Shingle the Roofs & build a good sentry Box on the top of each house & two strong gates of oak Plank of three Inches thick to be set up in the properest places with strong Iron Hinges. *O'Callaghan,* Col. Doc. 7:101

As the site of this fort is well known, and as the writer has elsewhere recovered points of pickets from 260 to 300 years old, much less deeply set, there is reason to suppose that the bases of these posts still remain where they were placed. The forts of that year were the last built for Indian use in New York.

A supposed feature of some forts may be mentioned. Dawson places round towers along the ramparts in his picture of Hochelaga, but they are not mentioned in the text unless inferentially. Similarly Parkman speaks of the wooden watchtowers surmounting the walls of a Huron town in 1646. The original may perhaps imply this. It reads:

> The young men were the night guard, mounting to the top of the sentry boxes, and singing war songs with a voice so terrible that the fields and neighboring woods bore these afar off. There could be no doubt that they were prepared to fight. Yet some Iroquois adventurers, notwithstanding these cries, secretly made their approach, making a resolute stroke. Seeing that sleep had silenced the sentinels, one of them climbed the tower like a squirrel, where he found two men asleep. He split the head of one, throwing the second below, where his companions scalped him, making off so fast that the Hurons could do nothing. *Relation,* 1646

Burial

Life and death are very close neighbors, and the care of the dead was an important affair with our aboriginal predecessors. Burial was not always the same, and but one or two features of this will now be described. For this statement we have both the results of excavations and the testimony of the Indians themselves. After relating his story of the vampyre, quaint David Cusick said:

> This important event was soon made known among the five nations, and afterwards changed their mode of burying, by sitting posture face to the east; but again they were troubled with the dead bodies, and were compelled to make some alterations in burying. *Beauchamp,* p.30

A passage from J. V. H. Clark may be quoted, though the writer knows of not a single fact in its favor in New York. In Canada it was a common practice with the Hurons and other relatives of the Iroquois. Mr Clark said:

> The most ancient mode of burial by the Iroquois, says La Fort, was first to place the corpse upon a scaffold some 8 feet high,

made by setting crotches and laying poles across, attached or near to one corner of the cabin of the nearest friend of the deceased. There the body was left exposed till the flesh had completely fallen off. After this, the skeleton was buried, placing the bones of the feet first, crowning the pile with the skull. *Clark,* 1:51

Morgan's testimony is quite as explicit that the same mode anciently prevailed among them, but it is probably a reminiscence of the time when they were one with the Hurons:

The body of the deceased was exposed upon a bark scaffolding, erected upon poles, or secured upon the limbs of trees, where it was left to waste to a skeleton. After this had been effected . . . the bones were removed, either to the former house of the deceased, or to a small bark house by its side, prepared for their reception. In this manner the skeletons of the whole family were preserved from generation to generation. *Morgan,* 1:166

He represents them as afterward gathered and buried in the Huron way. This may have come from tales of Huron captives, but a footnote is stronger still: "There are Senecas now residing at Tonawanda and Cattaraugus, who remember having seen about 60 years ago, at the latter place, these bark scaffoldings on which bodies were placed."

The Senecas were affected by western customs and had seen such things, but that they had seen them in New York thus recently is improbable. The Jesuit Relations, early travelers, the Moravians, Sullivan's soldiers, all described graves and burial, but with no allusions to scaffolds here. Occasional ossuaries suggest the Huron customs, but they were early and few. Separate and permanent burial seems the Iroquois rule. De Vries described a secondary burial among the northern Indians, resembling the Huron dead feast, but gave no time or place. The Nanticokes also removed the bones of their friends here after they came to New York, but this is exceptional. Colden was told of the cremation of a corpse at Oswego, that some western Indians might carry the bones home.

Arent Van Curler's account of some Oneida graves in 1634 is the oldest that we have of those among the Iroquois. The travelers came toward the town from the east:

Before we reached the castle, we saw three graves, just like our graves in length and height; usually their graves are round. These

graves were surrounded with palisades that they had split from trees, and they were closed up so nicely that it was a wonder to see. They were painted with red, and white, and black paint; but the chief's grave had an entrance, and at the top of that was a big wooden bird, and all around were painted dogs, and deer, and snakes, and other beasts. *Wilson,* p.92

In the curious account of the Iroquois written in 1666, which ignores scaffold sepulture, we have the particulars of some more common tombs, where wood was used:

As regards the dead, they inter them with all they have. When it is a man they paint red calumets, calumets of peace on the Tomb; some times they plant a stake on which they paint how often he has been in battle; how many prisoners he has taken; the post ordinarily is only four or five feet high and much embellished. *O'Callaghan,* 1:8

On a small scale this was like that which gave its name to Painted Post. Other writers add some things to this regarding the emblems displayed. Colden describes the grave as a large round hole, in which the body is placed upright or sitting; "it is covered with timber, to support the earth which they lay over, and thereby keep the body from being pressed; they then raise the earth in a round hill over it." An earlier writer may be cited whose account is more general: "They place as much wood around the body as will keep the earth from it. Above the grave they place a large pile of wood, stones, or earth, and around and above the same they place palisades resembling a small dwelling." *Van der Donck,* 5:201

The accounts of Megapolensis, De Vries and others differ but little.

When some Frenchmen died at Onondaga lake in 1656, and the Onondagas came to bewail their death, a chief said to their friends: "This present is to level the earth in which I have put them, and this other to erect a palisade around their tombs, in order that the beasts and birds of prey may not disturb their repose." *Relation,* 1657

Mention has been made of three notable Oneida tombs. Father Bruyas speaks of another built there in 1672. Because of a dream, the body of a noted juggler was taken up and carried "over the

road of Gandastogue', where they have erected the most beautiful mausoleum which is seen among these barbarians." What it was like may be inferred from the following account of others, written by one of Sullivan's men in the campaign of 1779. Lieutenant Beatty said some of the graves at Kendaia were very curious:

One in particular which I believe was some Chief or great man & was buryed in this manner; the body was laid on the surface of the earth in a Shroud or Garment, then a large Casement made very neat with bords something larger than the body & about 4 foot high put over the body as it lay on the earth and the outside & top was painted very curiously with great many Coulours, in each end of the Casement was a small hole where the friends of the Deceased or any body might see the corps when they pleased, then over all was built a large shed of bark so as to prevent the rain from coming on the Vault. *Conover,* p.29

Another officer described these as "three grand tombs, where it is supposed they buried some of their chiefs, they were all painted very fine, and covered with a frame and bark, on the top of the whole."

The surface burial of one of these chiefs is quite different from the scaffold sepulture of the Hurons and is the only one recorded in New York. A brief extract will show the Huron mode:

Those who have the care of the funeral prepare the litter where the dead is laid upon a mat and wrapped in a beaver robe, and then they lift it up and bear it by four corners; all the village following in silence as far as the cemetery. There is there a tomb made of bark, and set-up on four posts of about eight or ten feet high. While they adjust the dead there and arrange the barks, the Captain publishes the presents. *Relation,* 1636

Of course the white man's customs affected the Indian, and in none more than in burial. The protecting coffin appealed to his feelings. He made one himself of bark or of split and hollowed logs, but, if one still better was made for him, greatly was he pleased. There is something pathetic in the great Garakontie''s request, related by Father de Lamberville at Onondaga, that he "would make him a coffin of 4 planks, which he immediately provided." A sad task his friend had afterward: "After putting him in the coffin, which I had caused to be made to the best of my ability, we

lowered him into the grave without any of his relatives touching him, except to hold back the earth with pieces of bark, lest it might fall upon the coffin." *Relation,* 1680

Zeisberger and Frey had a similar request at Onondaga in August 1753. A prominent woman had died, and the chief Otschinachiata "requested us to make a coffin for the dead woman, which we did." *Zeisberger*

These accounts of burial are not full, little notice being taken of those parts in which the use of wood does not prominently appear, and they may be concluded with Clark's description of Onondaga graves a little over a century ago:

Their graves were usually dug about 3 feet deep. Barks were cut and peeled, of the length of the grave, pieces were fitted for the bottom, sides and ends, and then placed in the grave; a single broad piece was fitted for a covering. The corpse was then brought to the grave on poles bound together for a bier. He was then lowered into his bark coffin. . . The final covering was carefully placed over the whole, and the grave closed with earth. *Clark,* 1:51

Beside the other articles placed in graves, seeds and fruits are often found. Where there were no palisades branches were sometimes laid over them to shield them from the sun. The log coffins have been found.

Weapons

It is a natural and probable opinion that the spear and dart preceded the bow and arrow. First would come the weapon used in the hand, then its projection, then the means of throwing it yet farther. In the opinion of some the first means would be the cord attached firmly to an elastic stick and loosely to the dart, held in one hand and sprung by the other. When released the dart would be thrown to a distance, in a way familiar to most schoolboys. This is used by Indian boys in their play even now in New York. Figure 31 shows one of their darts, with a notch in one edge where the knot of the string is placed. A stick and knotted string furnish means of propulsion. The string is tied to the small end of the elastic stick, the knot is placed in the notch, the dart is drawn back by its base and suddenly released. The action is that of the bow, of which this may be called a half. There is no account or figure

of a weapon used in this way by the early New York Indians, and whether the present boyish game is a survival or one received from the whites is matter for conjecture.

The old javelin games of the Iroquois have almost disappeared; but one often yet sees Indian boys throwing their light sumac darts to see which will go farthest, using them with or without the stick and string. A light flat dart is used with these. For merely throwing it is but a cylindric stick, adorned with gay colors, nor is it now finished with the care of earlier days, when it was used in formal games. Of these, as played by the Senecas, Mr Morgan gave full and interesting descriptions, and these will be substantially followed here.

For the two games the javelins were differently made. In that with the hoop they were 5 or 6 feet long and less than an inch thick, and made of hickory or maple with great care. One end was sharpened, and the stick was spirally striped. Figure 39 shows this and figure 40 the hoop. The ring might be either a hoop or a wheel about 8 inches in diameter, and the dart was thrown at this, being held at the end or in the center. Sometimes four of the clans played against the others, from 15 to 30 players being on each side, each player having from three to six javelins. These were forfeited by the losers to the winning side. The hoop was rolled by one party in front of the line of their opponents, who threw their javelins as it passed. If it was hit, it was set up as a target, and each man of the opposite side took the place of the lucky player and threw his dart at it. If he hit it, he saved his missile; if he missed, his opponents took it and threw it again. If they were successful, the dart was out of the game and belonged to them. Then the hoop was rolled again by the other party, and the same course was followed. The game ended when one party had lost all its weapons. Morgan speaks of touching the hoop; the Onondagas tried to thrust their darts through, as in the game of chungke. The Seneca name for this game is *gä-na'-gä-o*, and the dart is *ga-geh'-dä*. Zeisberger gives *gaheskah* as the Onondaga name, which is now that of an arrow.

The common dart is now called *ka-none-cha'-ah* by the Onondagas. Morgan says the Seneca name of this game is *gä-ga-dä-ɣan'-duk*. The darts are slender and but rudely worked. Those which the writer has seen used are from 3 to 5 feet long and colored with native dyes. Usually they are merely thrown high in the air, but in a game some object was selected, which it was to strike in its descent and rebound. The farthest distance gained a point, and several might be scored on one side. The second party chose the object and distance for the next trial, and so it went on till one side had the necessary points.

The Iroquois bow differs from the short bow used by the prairie Indians, intended for a short range and ready handling on horseback. Of these Mr Catlin said:

> The result produced by them at the distance of a few paces is almost beyond belief, considering their length, which is not over 3, and sometimes not exceeding 2½ feet. It can easily be seen, from what has been said, that the Indian has little use or object in throwing the arrow to any great distance. *Catlin*, i. 142

Quickness was a more important element, and to keep the air full of arrows something of which to be proud. The practice of the Mandans, he said, "enables the most expert of them to get as many as eight arrows up before the first one reaches the ground." It is well that Mr Catlin stated the size of the western bow, as his drawings are often much out of proportion. In several he has represented bows at least 5 feet long.

The New York Indian required a different bow for use in the forest. His range was also usually short—sometimes long, but he shot deliberately, from behind his shield or a tree, often at small objects like birds or squirrels, or at some vulnerable point in larger game. His bow and arrows were made accordingly. We can not depend on early pictures, but long bows are usually placed in the hands of the Indians near the Atlantic coast. The artists who illustrated Capt. John Smith's varied productions sometimes made the bow exceed a man's hight, with very long arrows. Notably is this the case with a Susquehanna warrior, near in kindred to the New York Iroquois. His bow reaches above his head, and of him

Smith said, "He seemed the goodliest man that ever we beheld . . . His arrows were five-quarters of a yard long." But, while early writers speak of the excellent archery of the Indians, little is said specifically of their bows, whence it may be inferred they were much like those of Europe.

Mr Morgan said, "The Indian bow was usually from 3½ to 4 feet in length." Of three Onondaga bows in the writer's hands, one is 5 feet long and the other two a foot shorter. All are ⅞ of an inch wide. Another of elaborate and unusual character, made by an Onondaga for a friend, is wrapped with sinew in the contracted center, but has undulating edges beyond this, being nearly 1¾ inches wide. Figure 3 shows the modern Iroquois bow, and all Champlain's pictures have the bow quite long.

For 68 years the writer has known the arrow of the Onondagas and seen them shoot with it. For their own purposes they often make use of those which are without feathers, having an expanded and rather blunt wooden head, continuous with the shaft and called *ga-hes'-kah o-je-ko'-hah.* Figure 30 shows this, and it seems a survival of early days, when it was used to stun small game, as it is yet. The Onondagas say that the rustle of its fall through the trees helps them regain it. The small number of arrowheads found on Iroquois town sites of the last 300 years supports its antiquity. For home use and small game it was probably the favorite arrow. Larger stone points for larger game would naturally be used in distant hunts. Mr Morgan figured but did not describe this arrow. Figure 4, *a, b, c, d,* is from his work. That marked *c* was tipped with hollow horn and made by an Oneida in Canada. All of his figures include feathers, and on this point he said:

> The arrow was about 3 feet in length, and feathered at the small end with a twist to make it revolve in its flight. . . The English and Scottish archers feathered their arrows, but without this peculiarity. Three feathers were also used by them, which were set parallel with the arrow and with each other. But they were set upon one side of the arrow at its three quarters, and in such a way that the three parallel feathers formed obtuse angles with each other. The Indian used but two feathers, which passed around the opposite sides of the arrow in a twist, as shown in the figure. For this purpose the feather was stripped off from the quill, and tied to the arrow with sinew. *Morgan,* 1:296

The two feathers are not invariable, the writer having both Onondaga and western arrows feathered with three. Figure 6 shows the spiral twist on one from Onondaga. One side of the quill is taken and partially stripped at each end. Figure 8 shows this. Figure 7 shows the mode of attachment, with one feather ready for use. Sometimes there is no twist. Figure 47 shows the tipping of the arrow with a flint point by an Onondaga. Sharp arrows are called *o-yūn-ẅȳ-kun'* by them. Two feet is a common length.

Mr Morgan gives the Seneca word *ẅä-a'-no* for bow, and *ga'-no* for arrow. In Onondaga the former is *ah-ĕn'-nah,* and the latter *kah-hes'-kah.* The other Iroquois dialects vary quite as much.

Most of the Iroquois long ago abandoned the use of the quiver, but, as it was of leather it falls outside of the present general subject.

The blowgun, called *ga-ga-an'-da* by the Senecas, and *kah-sah-kĕn'-tah* by the Onondagas, is rare now, though once common. Morgan described it as a wooden tube, 6 feet long and an inch thick. In the half inch bore was placed a slender dart, 2 feet long, sharp pointed, and with a ball of thistle down at the base. The dart was discharged with great accuracy by blowing below it in the tube. The gun used at Onondaga by the writer was a little shorter, but the arrow was quite short, with red flannel at the base. Figure 53 shows both arrows, *a* being loaded with down and *b* with flannel. Figure 54 shows the blowgun much reduced. John Bartram's words, when he was at Onondaga lake in 1743, suggest these arrows. He said: "Our guides took their arrows, made of reed and down, to shoot small birds." Mr Ketchum quotes Weld's account of their use by the Senecas in 1796. The arrows were pointed with triangular bits of tin, the other end being wound with thistle down for about 2 inches. The tube was about 6 feet long and the arrow short and slender.

> The arrow is put into the end of the tube that is held next to the mouth; the down catches the breath, and with a smart puff they will fly to the distance of 50 yards. I have followed young Seneca Indians whilst shooting with blow-guns, for hours together, during which time I have never known them to miss their aim at the dis-

tance of 10 or 15 yards, although they shot at the little red squirrels, which are not half the size of a rat, and with such wonderful force used they to blow forth the arrows, that they frequently drove them up to the very thistle down, through the heads of the largest black squirrels. The effect of these guns appears at first sight like magic. The tube is put to the mouth, and in the twinkling of an eye you see the squirrel that it aimed at fall lifeless to the ground; no report, not the smallest sound even, is to be heard, nor is it possible to see the arrow, so quietly does it fly, until it appears fastened in the body of the animal. *Ketchum,* 2:190

The Algonquin word *tomahawk* originally belonged to the war club, called *cassetête* by the French, and, as each was intended to break the head, the change was natural. On this each nation placed its own mark, and it was often left behind to tell by whom some daring or violent deed was done. Loskiel said:

The Iroquois and Delawares, and the nations connected with them, do not declare war by a formal message, but rather send out a small party, seize the first man they meet, belonging to the nation they intend to engage, kill and scalp him; then cleave his head with a hatchet, which they leave in it, or lay a war-club, painted red, upon the body of the victim. *Loskiel,* 145

A Canadian Indian discovered an English army on Lake George in 1690. "He had suspended three tomahawks within sight of their cabins, indicating to them that they were discovered, and that he defied them to come to Montreal. These tomahawks are a species of club on which they carve figures and in that way manifest their wishes." *O'Callaghan,* Col. Doc., 9:479

In describing the Iroquois in 1666, it is said, "When they have finished, if they have casse-tetes or clubs, they plant them against the corpse, inclining a little towards the village of the slain." *O'Callaghan,* Col. Doc., 9:48

In the same interesting account the Wolf holds a round-headed club in his hand. Figure 55 shows another from the same with unusual features. A small projection, suggestive of a thumb, seems intended to afford a better hold at the small end. The top is squarer than usual, and would not suggest the war club but for its explicit mention. It might possibly be reversed, making the sharp projection the deadly part, but this hardly seems probable. It is said to

represent the "club which they use to break the skull when they are at war."

The late Rev. F. P. Winne, of Watertown N. Y., gave the writer an interesting account of sundry relics of King Philip, which came into the hands of the Rev. John Checkley, Mr Winne's maternal ancestor. Among these was King Philip's war club, which was in the hands of another descendant living in New Hartford N. Y., some 20 years ago. Thence it went to Maine. Mr Winne wrote:

> The club I have had in my hands many times, and can describe it. It is a piece of hard wood,—hard maple, I think—about 14 inches long, shaped somewhat like this, (figure) a solid ball about 4 inches in diameter, which, with the handle, is cut out of one piece of wood. Along the handle on both sides are inserted triangular pieces of what appear to be, and I suppose are oyster shells; the dark pieces showing the number of Indians Philip had killed, and the light pieces the whites. *Winne*

John Josselyn, in 1675, said of the New England Indians, that they have "*tomahawks* which are staves two feet and a half long, with a knob at the end as round as a bowl, and as big as that we call the Jack or Mistriss." *Josselyn*, 23:309

This will suffice to show the identity and use of two noted war implements. Mr Morgan figured and described two kinds of war clubs; one of horn with an inserted blade, derived from the west and often illustrated by Catlin. The other is one of the primitive New York forms, terminated by a large knot or stone ball. These balls, of grooved or ungrooved stone, were frequent here and quite recently in use. The long grooved pebbles of Seneca lake seem to have had a different purpose. Figure 28 shows a wooden club of this kind, the large ball being of the same piece as the handle. The Onondagas call this *kah-jee'-kwah*. Sometimes a carved hand clasps the ball, but they are often quite simple. Figure 29 is an Onondaga club of this kind, belonging to the writer. It was used in dances and is black, of hard wood, and 22 inches long. David Cusick has both of Morgan's forms in his quaint pictures.

Mr Morgan did not class the spear among Iroquois weapons, nor did he think they used it. Suitable points for this are quite rare on Iroquois sites, but there are early allusions to it, possibly as an

implement derived from the whites. Father Bruyas has but one allusion to it in his Mohawk words: "*Wahannakwinniont.* He made a pike or spear enter." It was little used in war, but found an appropriate place in fishing. At a much earlier day it must have been frequent, judging from the abundance of large stone points.

A shield was part of a warrior's full equipment when he had only arrows to face, but it was soon disused when found not bullet-proof. Other defensive armor went with it. When Champlain met the Mohawks in 1609, he said: "The Iroquois were greatly astonished seeing two men killed so instantaneously, notwithstanding they were provided with arrow proof armor, woven of cotton thread and wood."

Van Curler saw a sham fight in the fourth Mohawk castle, Dec. 23, 1634, which he thought rough. "Some of them wore armor and helmets that they make themselves of thin reeds and strings so well that no arrow or ax can pass through to wound them." *Wilson,* p.91

A missionary in Lower Canada in 1633 was surprised at a shield he saw:

> He bore with him a very large buckler, very long and very wide; it covered all my body easily, and went from my feet up to my chest. They raise it and cover themselves entirely with it. It was made of a single piece of very light cedar; I do not know how they can smooth so large and wide a board with their knives; it was a little bent or curved in order the better to cover the body, and in order that the strokes of arrows or of blows coming to split it should not carry away the piece, he had sewed it above and below with cord of skin: they do not carry these shields on the arm; they pass the cord which sustains them over the right shoulder, protecting the left side; and when they have aimed their blow they have only to draw back the right side to cover themselves. *Relation,* 1633

Daniel Gookin, an early New England writer, mentioned Indian shields. "Their weapons heretofore were bows and arrows, clubs and tomahawks, made of wood like a pole-axe, with a sharpened stone fastened therein; and for defence, they had targets, made of barks of trees." *Gookin,* 1:152

In New York, Van der Donck said, "their weapons were formerly bows and arrows, with a war-club hung to the arm, and a square

shield which covered the body up to the shoulders." *Van der Donck,* 5:211

The people of Hochelaga seem to have had armor in 1535, which they showed to Cartier when they described some enemies: "an evill people, who goe all armed even to their fingers' ends. Also they shewed us the manner of their armour, they are made of cordes and wood, finely and cunningly wrought together." *Dawson,* p.37

Mr Walter Hough has illustrations of various kinds of coats of mail in his paper, *Primitive American Armor,* from specimens in the National Museum, dividing these into slat, rod, skin, plate, band and cotton-padded armor. The first three he ascribes to the Iroquois. For the use of slats bound together he adduces only a remark made by Charlevoix, that, "when they attacked any intrenchment, they covered their whole body with small, light boards." The remark applies but to one instance, where boards were hastily made and then thrown aside. For the use of skins he quotes from *New England Prospect,* that the Mohawks "wear sea-horse skins and barks of trees made by their art as impenetrable, it is thought, as steel, wearing a headpiece of the same." There is nothing to support this, the reference being to woven armor, and the error is in the material. At the time Wood wrote, the Mohawks had no access to the sea, and he probably had never seen one. This leaves the woven rods as the usual Iroquois body armor.

Many early writers may be quoted beside those given. Lafitau said "their cuirasses were a tissue of wood, or of small sticks of reed cut of proportionate lengths, strongly pressed against each other, woven and enlaced very neatly with small cords made of deer skin." They had similar armor for the limbs. The testimony of Charlevoix is much the same. Figure 59 is from Champlain's picture of a warrior in armor, which agrees well with those which follow.

Figure 57 is a rear view of a western coat of mail, made of sticks and twine, which may fairly represent that of the Iroquois. Several New York pipes and carved heads have helmets like that in figure 58. They seem made of a series of hoops, gradually becoming smaller and sometimes with a knob at the top. They were woven with twine. Another kind was cylindric, with some animal's head in front and a cover for the neck behind.

In an attack made by some Iroquois in Canada, in 1642, one "received seven buckshot in his shield, and as many in his body." Being cumbersome in the woods bucklers soon disappeared when found useless, yet the Mohawk name of *onneregware* for shield is preserved in the vocabulary of Father Bruyas, in 1675. The Iroquois might have even then found them useful in their wars in Illinois, and, if not, the sight of the western shields would have kept them in mind.

A curious use of a temporary shield occurred in 1660, being the one referred to by Charlevoix, when a party of Hurons and French were attacked by Onondagas and Mohawks. They took shelter in an abandoned fort:

> The Iroquois came headlong, and with bowed head, to gain the palisade, and they aimed at sapping it by strokes of axes, with a courage which made them close their eyes to all dangers, and to the continual discharges which they made upon them. It is true that to secure themselves from the greater part of this hail, they made mantelets of three blocks of wood, bound side by side, which covered them from the top of the head even to the middle of the thighs, and by this means they fixed themselves under the gunners of the curtains. *Relation*, 1660

Another instance is that of the use of canoes as shields and ladders in the Erie war. The Iroquois had attacked an Erie fort which was bravely defended. Every assault of the besiegers was repulsed:

> They took counsel to use their canoes as bucklers; they carried them before them, and by favor of this shelter behold them at the foot of the intrenchment. But it is needful to climb the great stakes, or the trees of which it is built. They set up their same canoes, and make use of them as ladders to mount upon this great palisade. *Relation*, 1656

This recalls what Capt. John Smith said of the Massawomeks, whom he met in Virginia, and who may have been a clan of the Eries. In his several accounts he showed his high esteem of their defensive armor. He bought shields of these and of the Susquehannas, calling them presents. The former he found useful when attacked by Indians, who had nearly taken one of his party:

> Here, too, we found the value of *Mosco's* counsel, for he advised us to set the *Massawomek* targets about the forepart of our boat, like a forecastle, and they stood us in good stead, for, from behind

them, we could fire at the savages and beat them off the plain, without any hurt to ourselves; yet they shot more than a thousand arrows, and then fled into the woods. Arming ourselves with these light targets (which are made of small sticks, interwoven with strings of their hemp and silk grass), we rescued Todkill. *Smith, Captain*

With these good results and this warning, "we spent the rest of the day in fortifying our boat with our Massawomek shields." This was a high tribute to their value. He added: "As we went along, we are continually being shot at, but no hurt was done, because of our shields." A later and more formidable attack came. "More than a hundred arrows stuck in our targets and about the boat, yet none hurt."

Figure 66 shows the angular Canadian shield as represented by Champlain, with a straight base and curved top. He figured some sufficiently curved to stand by themselves, sheltering the warriors behind them. Figure 65 is a circular and more western shield from the same author. Both have fastenings for the arms, rather than the shoulders. The round bucklers of the Mohawks were mentioned in 1642, and they used both forms.

The fish spear, with either a bone or stone head, and often with none at all, being merely a sharpened stick, was undoubtedly used at an early day. The earlier Iroquois sites of the colonial period furnish many examples of the large bone harpoon, barbed on one side. The use of metal brought other forms. One for spearing eels by night, used in Canada in 1634, is thus described:

This harpoon is an instrument composed of a long pole, thick as three fingers, at the end of which they attach a pointed iron, which they arm on both sides with two recurved sticks, approaching each other at the end of the iron point; when they come to strike an eel with this harpoon, they spit it on this iron, the two sticks adjoining yielding to the force of the blow, and allowing the eel to enter; then they tighten of themselves, because they open only by the shock of the stroke. they prevent the spitted eel from getting out again. *Relation,* 1634

It is probable that the plan of this spear was very old, iron being substituted for bone, but the wooden sides remaining the same. In New York it long maintained its place. John Bartram was at Oswego Falls in 1743, and saw how the Indians took fish there with

a differing spear: "They strike them with long slender shafts 10 or 20 feet long, pointed at the end with iron, see the shape. The 2 splints of wood spreading each side, directs the point into the fish, which at a great depth it would be otherwise difficult to hit." *Bartram,* p.47

In this the splints expanded towards the point, instead of contracting, the object of their use being somewhat different, but this is but a modification of the early idea, fully described only in Canada and New York.

Warlike usages

Running the gauntlet was a captive's customary trial among eastern Indians. He had to pass through two long lines of men, women and children, who inflicted blows as they were passed. Thorn branches were favorites for this, but there was a long array of other things. At the end of this the early Iroquois had a peculiar custom. That all might see the better, a bark scaffold was erected in every town, where prisoners were placed. In large camps a temporary structure was made. Other nations may not have used these. The Mohawks called this *askwa,* and several terms belonged to it. *Gaskontaraton* was to put the barks on it, in preparation for the torture; *askwawcron* was to take the prisoner from it. It was also called *ennisera,* or a high place.

The Jesuit Relations have the fullest accounts of these. Father Bressani was placed on one in a Mohawk camp in 1644. It was 6 feet high, and on it he had to sing and be tortured for several days. In the Mohawk towns he was placed on others. When Jogues and his friends were taken there in 1642, they ran the gauntlet. "Afterward they made them mount, entirely naked, a prepared scaffold, which is at the entry of the town." *Relation,* 1644

This location of the scaffold is in an account of the sufferings of Jogues by others. He himself placed it elsewhere after describing their painful entrance: "It was with great difficulty, under this hail of blows, that we reached the scaffold erected for us in the center of the village, our bodies all livid, and our faces streaming with blood." *Relation,* 1647

In 1665 the scaffold is said to have been in the Oneida village square. In 1653 Father Poncet was placed on a scaffold 5 feet high, in the center of a Mohawk town, and this was the usual place. If the prisoners were numerous, another scaffold was built. Posts rose above these, and the captives were tied to them for several days, tortured by slow fires and other cruel applications. Sometimes they had a speedier and less painful death.

On the return from a raid they secured the prisoners in various ways. Figure 63 is from an account written in 1666, which says:

> They place his leg between these two posts in the hollow of the larger—that is the two posts catch the leg above the ankle, and they afterwards join one to the other and tie them at a man's height—sometimes higher, so that it is impossible to withdraw the foot without untying the cords. *O'Callaghan,* 1:11

Lafitau described a mode mentioned by others. For each prisoner four stakes were driven in the ground. They were laid on their backs and an arm or a leg was attached to each stake far apart. A halter was passed several times around the neck and fastened to a fifth stake. There were other ingenious devices.

The various memorial posts and paintings on bark deserve attention. Each cabin had its painted totem without, and often records of exploits within. For more public purposes, posts were sometimes erected, but oftener the bark was stripped from a tree, and the required painting made on the whitened wood. Colden and others have given accounts of these. The former said that on the tree they painted a representation of the party as it left the town, and another on the return. Quite a full account of all is given in the French description of the Iroquois clans in 1666, from which figures and notes are here taken.

First are figures of the nine Seneca clans, the nations not always having the same number. Figure 69 shows the totem of the Turtle clan, bearing a hatchet. Figure 70 is the Wolf with a war club. Figure 71 is the Bear carrying a sword or knife. These are the clans common to all the Iroquois. Figure 72 is the Beaver clan with an ax. Figure 76 the Great Plover with a club. Figure 75 the Little Plover with a sword. These sometimes form one clan.

Figure 74 is the Eagle clan with a hatchet, and this is often called the Hawk. Figure 73 is the Deer, and figure 77 the Potato, both unarmed. This is the only mention of the latter:

When they go to war, and wish to inform those of the party who may pass their path, they make a representation of the animal of their tribe, with a hatchet in his dexter paw; sometimes a sabre or club; and if there be a number of tribes together of the same party, each draws the animal of his tribe, and their number, all on a tree from which they remove the bark. The animal of the tribe which heads the expedition is always the foremost. . . On their return, if they have prisoners or scalps, they paint the animal of the tribe to which they belong, rampant (*debout*) with a staff on the shoulder along which are strung the scalps they may have, and in the same number. After the animal are the prisoners they have made, with a *chichicois,* (or gourd filled with beans which rattle), in the right hand. If they be women, they represent them with a *Cadenette* or queue and a waistcloth. If there be several tribes in the war party, each paints the animal of his tribe with the scalps and prisoners it has made, as before, but always after that which is head of the party. . . When they have lost any men on the field of battle they paint the men with the legs in the air, and without heads and in the same number as they have lost; and to denote the tribe to which they belonged, they paint the animal of the tribe of the deceased on its back, the paws in the air, and if it be the chief of the party that is dead, the animal is without the head. If there be only wounded, they paint a broken gun which however is connected with the stock, or even an arrow, and to denote where they have been wounded, they paint the animal of the tribe to which the wounded belong with an arrow piercing the part in which the wound is located; and if it be a gunshot they make the mark of the ball on the body of a different color. If they have sick, and are obliged to carry them, they paint litters (*boyards*) of the same number as the sick, because they carry only one on each litter. *O'Callaghan,* 1:4

Figure 80 *a.* This is a person returning from war who has taken a prisoner, killed a man and a woman whose scalps hang from the end of a stick that he carries. *b.* The prisoner. *c. Chichicois* (or a gourd) which he holds in the hand. *d.* These are cords attached to his neck, arms and girdle. *e.* This is the scalp of a man, what is joined on one side is the scalp-lock. *f.* This is the scalp of a woman; they paint it with the hair thin. *O'Callaghan,* 1:7

Other figures follow from the same account. Figure 78. "Council of war between the tribe of the Bear and that of the Beaver; they

are brothers. . . L. Is a belt which he holds in his paws to avenge the death of some one and he is conferring about it with his brother, the Beaver." Figure 79. "Council for affairs of state." The Bear and Turtle alone appear here, but the others may be added, each on its own side of the council fire. Figure 82. "Canoe going to war. Q. Paddles. They know hereby how many men there are in the canoe, because they place as many paddles as there are men. Over these is painted the animal of the tribe to which they belong." Figure 61. "This is a man returning from hunting who has slept two nights on the hunting ground and killed three does; for when they are bucks, they add their antlers. What is on his back, is his bundle." Figure 81 belongs to the same, described as follows: "T. Deer's head. This is the way they paint them. V. This is the manner they mark the time they have been hunting. Each mark or rather each bar is a day." Figure 62. "Fashion of painting the dead; the first two are men and the third is a woman who is distinguished only by the waist cloth that she has." Figure 83 is collectively "The Portrait of a Savage on a board in their cabin on which they ordinarily paint, how often he has been to war; how many men he has taken and killed." The description of the several parts follows: "*a.* These are punctures on his body. *b.* This is the way they mark when they have been to war, and when there is a bar extending from one mark to the other, it signifies that after having been in battle, he did not come back to his village and that he returned with other parties whom he met or formed. *c.* This arrow, which is broken, denotes that they were wounded in this expedition. *d.* Thus they denote that the belts which they gave to raise a war party and to avenge the death of some one, belong to them or to some of the same tribe. *e.* He has gone back to fight without having entered his village. *f.* A man whom he killed on the field of battle who had a bow and arrows. *g.* These are two men whom he took prisoners, one of whom had a hatchet, and the other a gun in his hand. *gg.* This is a woman who is designated only by a species of waistcloth. *h.* This is the way they distinguish her from the men. Such is the mode in which they draw their portraits." *O'Callaghan,* 1:9

There was a mention of this picture writing in 1642, when Father Jogues was captured by the Mohawks: "These barbarians, returning to their country, painted their victories on the trees which bordered the mouth of their river; they placed on the banks the heads of those whom they had massacred; they scrawled the visage of their prisoners; the figure of poor Isaac Jogues appeared among the others." *Relation,* 1642

Loskiel described this custom for memorial purposes:

They generally chuse a tall well-grown tree, standing upon an eminence, and peeling the bark on one side, scrape the wood till it becomes white and clean. They then draw with ruddle, the figure of the hero whose exploits they wish to celebrate, clad in his armor, and at his feet as many men without heads or arms as fell by his own hands. These drawings may last above fifty years, and it is a great consolation to the dying warrior, that his glorious deeds will be preserved so long. *Loskiel,* 1:25

In the unpublished Moravian journals these and other posts are often mentioned. When Cammerhoff and Zeisberger were going to Onondaga in 1750, they camped one night where "were 3 posts painted red, on which the Indians had fastened by their feet, according to their usual custom, the 3 Gatabes [Catawbas] whom they had taken prisoner." *Cammerhoff*

They crossed a creek flowing into the east side of Cayuga lake, which seems to be Salmon creek, then called Gientachne. War parties usually encamped there:

Here we saw the whole chancery court or archives of the Gajukas, [Cayugas] painted or hanging in the trees. Our Gajuka gave us a lengthy explanation of it all. When the great warriors go to war against the Gatabees, they make a painting of themselves. We saw several of these fine works of art done in Indian style. On their return they add their deeds in a painting, showing how many scalps they have taken, what they bring with them in the shape of treasures, bracelets, wampum and the like. The Gajuka pointed out to us with much importance, what he had himself painted, as he had been to war twice. The one time he had brought back 8 prisoners and 2 scalps, and on the other occasion 3 prisoners. *Cammerhoff*

When near Nine Mile creek, between Skaneateles and Onondaga, they came to another place of less note. The Cayuga guide

"explained to us that the War Archives, which we had found on the trees, had been painted by French Indians (their paintings can be recognized by the crosses which they paint on them) when they made war upon the Cherokees and brought back prisoners from them. We named our quarters the French Camp;" and Zeisberger often stopped there afterward.

One more incident of a similar kind appears in this journal. Their Cayuga guide had been sent ahead with the horses, and at one of their camps they heard from him. "By the paintings on the trees we at once discovered that our Gajuka had been here. He had shot 3 bears and 3 deer, and had slept here for 3 nights. All this we could tell from the horses and figures painted on the trees."

Mary Jemison, the White Woman, said that the war chief of each Iroquois nation had a war post in the town to record great events. It was a peeled stick, 10 or 12 feet high. For a campaign he made a perpendicular red mark, about 3 inches long and half an inch wide. On the opposite side a perpendicular cross, with equal limbs, represented a scalp taken. On another side a prisoner was represented by a St Andrew's cross, with a dot in the upper angle. Her husband had such a post for his personal use and others had the same. Heckewelder, in going to the Wabash river in 1792, mentioned an Indian meeting place: "Three tall painted war posts had been erected there, and there were three large distinct encampments."

The customs regarding the beginning of a war, the setting out and return of parties were not always alike, and Mr Morgan has given one of many. War was declared in council, and his remarks about the war post alone are quoted:

> The existence of the war was indicated by a tomahawk painted red, ornamented with red feathers, and with black wampum, struck in the war-post in each village of the League. . . Dressed in full costume, the war-chief who proposed to solicit volunteers and conduct the expedition, went through the village sounding the war-whoop to announce his intentions; after which he went to the war-post, *Gä-on-dote'*, and having struck into it his red tomahawk, he commenced the war-dance. *Morgan,* 1:330

By way of contrast, may be read Father Dablon's account of the leisurely preparations for war made every winter at Onondaga, describing the war dance, but saying nothing of the war post:

First of all the war kettle, as they call it, is hung over the fire as early as the preceding autumn, in order that each of the allies going to the war may have an opportunity to throw in some precious morsel, to be kept cooking through the winter, by which act they are solemnly pledged to take part in the proposed enterprise. The kettle having been kept steadily boiling up to the month of February, a large number of warriors, Senecas as well as Cayugas, gathered to celebrate the war-feast, which continues for several nights in succession. *Relation,* 1656

One of the stories about Painted Post was that of Patchin, the captive. He related the following incident, though unable to give the time of its occurrence:

An Indian chief on this spot had been victorious in battle, killing and taking prisoners to the number of about sixty. This event he celebrated by causing a tree to be taken from the forest, and hewed four-square, painted red, and the number he killed, which was twenty-eight, represented across the post with black paint, without any heads; but those he took prisoners, which was thirty, were represented in black paint, as the others, but with heads on. This post he erected.

Patchin observed that, whenever this post decayed, it was renewed and repainted. This is quite different from and less probable than the received story which follows:

In the summer of 1779, a party of tories and Indians, under the command of a loyalist named MacDonald, returned from an incursion into the Susquehanna settlements, bringing with them many of their number wounded. At the confluence of Tioga and Conhocton rivers, Captain Montour, son of the famous Queen Catharine, a chief of great promise, died of his wounds. "His comrades buried him by the riverside, and planted above his grave a post on which were painted various symbols and rude devices. This monument was known throughout the Genesee Forests as '*The Painted Post.*' It was a landmark well known to all the Six Nations, and was often visited by their braves and chieftains." This account of the origin of the Painted Post was given to Benj. Patterson, the hunter, by a man named Taggart, who was carried to Fort Niagara a prisoner by MacDonald's party, and was a witness of the burial of Capt.

Montour, or at least was in the encampment at the mouth of the Tioga at the time of his death. Col. Harper, of Harpersfield, the well known officer of the frontier militia of New York in the Revolution, informed Judge Knox, of Knoxville, in this co., that the Painted Post was erected over the grave of a chief who was wounded at the battle of the "Hog-Back" and brought in a canoe to the head of the Chemung, where he died. It was well understood by the early settlers that this monument was erected in memory of some distinguished warrior who had been wounded in one of the border battles of the Revolution and afterward died at this place. The post stood for many years after the settlement of the co.; and the story goes that it rotted down at the butt, and was preserved in the bar-room of a tavern till about the year 1810 and then mysteriously disappeared. It is also said to have been swept away in a freshet. *McMasters,* p.34

In spite of the prominent place given to the war post by recent writers, the early ones almost ignore it. Charlevoix mentions it incidentally:

As often as any one in the public dances strikes the post with his hatchet, and recalls to memory his most signal exploits, as is always the custom, the chief under whose conduct he performed them, is obliged to make him a present; at least this is usual among some nations. *Charlevoix,* 1:332

The same writer said: "All those who enlist themselves, give also to the chief, as a token of their engagement, a bit of wood with their mark upon it." He also noticed another feature:

They have a kind of standards or colours to know one another by, and to enable them to rally; these are small pieces of bark cut into a round form, which they fix to the head of a pole, and on which is drawn the mark of their nation or village. If the party is numerous, each family or village has its peculiar ensign with its distinguishing mark. Their arms are also adorned with different figures, and sometimes with the mark of the chief. *Charlevoix,* 1:338

A novel use of sticks in battle was noted by another writer, in a fight between some Onondagas and Canadian Indians:

The captains of these two little troops encourage their men, they exhort them not to give way, and to die sooner than to flee. It is the custom of these captains when they find themselves close to the occasions, to produce some sticks, which they bring for this purpose, and present them to their warriors in order to fix them in

the ground, that they may protest by this action that these sticks shall sooner leave their place than they shall turn their faces. Yet it often happens that the sticks firmly remain, but the warriors do not give up flight. *Relation,* 1646

There was another shrewd use of sticks mentioned by Champlain in the expedition against the Mohawks in 1609. Before they entered Lake Champlain there was the usual divination to foretell their success:

After they learned from their diviners what was going to happen to them, the chiefs take some sticks a foot long, as many in number as they are, & point out their chiefs by others a little larger: Then they go into the wood, & level off a space of 5. or 6. feet square, where the chief, as sergeant major, places all these sticks in order as seems good to him: then calls all his companions, who come fully armed, & shows them the rank & order which they ought to keep when they should fight with their enemies: which all the savages observe attentively, remarking the figure which their chief has made with these sticks: & afterward they go away from thence, & begin to put themselves in order, as they have seen the aforesaid sticks: then they mingle one with another, & return again in their order, continuing this two or three times, & at all their quarters without there being need of a sergeant to make them keep their ranks, which they very well know how to keep without getting into confusion. This is the rule which they observe in war. *Champlain,* 1:336

The number of hostile Iroquois in the vicinity of Three Rivers, in 1637, was shown by 150 small sticks which they attached to a tree, and this way of counting was frequent at treaties or when promises of aid were given.

Canoes and fishing

Canoes were of two kinds: those of bark and those made by hollowing trunks of trees. The latter were used mostly along the Hudson river and sea coast; the former in the interior. Sometimes both were found in these two districts. A second division of bark canoes was that of the Iroquois and those of the Canadian Algonquins and Hurons. In the home territory of the former there was little canoe birch, and the bark of the red or slippery elm was used and sometimes the bitternut hickory. At a later day they also had birch canoes, but at first the line was sharply drawn. On the St Lawrence an Iroquois canoe was readily known afar off. While

this distinction appears in all early writers, Baron Lahontan was the only one of these who imperfectly figured the Iroquois bark canoe, which he did by way of contrast with that made of birch. His description and figures follow:

The Iroquese canoes are so dull and large that they can not sail near so quick as those made of birch bark. The former are made of elm bark, which is very heavy, and the form is very awkward; for they are so broad and long that 30 men row in them, two abreast, whether sitting or standing, and the sides are so low that they dare not venture them upon the lakes, though the wind be very slack. *Lahontan,* 1:77

Figure 88 is his picture of this, with its men in place, and figure 87 represents his birch canoe. By way of contrast, figure 84 shows a modern elm bark canoe from Morgan, about 25 feet long and with a capacity of 2 tons. His description follows:

Having taken a bark of the requisite length and width, and removed the rough outside, it was shaped in the canoe form. Rims of white ash, or other elastic wood, of the width of the hand, were then run around the edge, outside and in, and stitched through and through with the bark itself. In stitching, they used bark thread or twine, and splints. The ribs consisted of narrow strips of ash, which were set about a foot apart along the bottom of the canoe, and having been turned up the sides, were secured under the rim. Each end of the canoe was fashioned alike, the two side pieces inclining towards each other until they united, and formed a sharp and vertical prow. . . Birch bark retained its place without warping, but the elm and hickory bark canoes were exposed to this objection. *Morgan,* 2:26

M. Pouchot gave an early account of the elm canoe:

After having taken off the whole in one piece, they shave off the roughest of the bark, which they make the inside of the canoe. They make end ties of the thickness of a finger, and of sufficient length for the canoe, using young oaks or other flexible and strong wood, and fasten the two larger folds of the bark between these strips, spreading them apart with wooden bows which are fastened in about 2 feet apart. They sew up the two ends of the bark with strips drawn from the inner bark of the elm, giving attention to raise up a little the two extremities, which they call *pinces,* making a swell in the middle and a curve on the sides, to resist the wind. If there are any chinks, they sew them together with thongs, and cover them with chewing gum, which they crowd in by heating it with a coal of fire.

The bark is fastened to the wooden bows by thongs. They add a mast, made of a piece of wood, and crosspiece to serve as a yard, and their blankets serve them as sails. *Pouchot,* 2:217

Not all elm bark canoes were large, and Alexander Henry described in making of two small ones near Toronto in June 1764:

We were employed two days in making canoes out of the bark of the elm-tree, in which we were to transport ourselves to Niagara. For this purpose the Indians first cut down a tree; then stripped off the bark in one entire sheet of about 18 feet in length, the incision being length-wise. The canoe was now complete as to its top, bottom and sides. Its ends were next closed, by sewing the bark together; and a few ribs and bars being introduced, the architecture was finished. In this manner we made two canoes; of which one carried eight men, and the other, nine. *Henry,* p.172

Charlevoix also noted the size. "The bark of the red elm is that of which the Iroquois make their canoes. Some of them which are made of one single piece, will contain twenty persons." *Charlevoix,* 1:249. Of the two kinds he said: "The one of the bark of elm, wider, and of very coarse workmanship, but commonly the largest. I know of no nation but the Iroquois, which have any of this sort." *Charlevoix,* 1:293. Kalm had a canoe of white elm bark and described its building. He said this was preferred as "being tougher than the bark of any other tree." *Kalm,* 2:130

These were easily made when the bark slipped, but not at other times, and early records often mention this. For home use the Mohawks made those which carried but two or three men. When Canadian wars ceased, they adopted birch bark. The famous white canoe of Hiawatha may have been of this kind, strongly contrasting with the darker elm bark of the Onondagas. When Cammerhoff and Zeisberger wished to go up the lake from the Cayuga village in 1750, they could get no boat. "As the canoes are all made of birch, the few which were to be had were cracked and dried up by the heat of the sun." Elkanah Watson was on Onondaga lake with other explorers in 1791, and said: "We passed several birch canoes with Onondago Indians, returning from fishing, accompanied by all their families, children, dogs, cats, fowls, etc. These birch canoes are extremely light—they sail like ducks upon the water, and some of them are whimsically painted." *Watson,* p.350

These may have changed somewhat in form from economic reasons. Good material is less abundant, and every useless pound adds to the labor at the portage. High bows catch the wind and make harder rowing, but all essential features remain. The general Onondaga name is ka-hone'-wah. Figure 85 shows a frequent form. Figure 90 is drawn from a plate in Bartlett's *Canadian Scenery,* published about 60 years ago, and is called "Canoe building at Papper's island." Canadian Indians, in modern costume, are fastening the bark on the frame, a woman is perforating other pieces, women wear the burden strap and carry paddles and baskets, a temporary bark hut appears on the right, such as travelers used in New York. It illustrates many features of Indian life. Some birch canoes were small. M. Pouchot described the larger ones:

The frame of these canoes is made of strips of cedar wood, which is very flexible, and which they render as thin as a side of a sword scabbard, and three or four inches wide. They all touch one another, and come up to a point between the two end strips. This frame is covered with the bark of the birch tree sewed together like skins, secured between the end strips, and tied along the ribs with the inner bark of the roots of the cedar, as we twist willows around the hoops of a cask. All these seams are covered with chewing gum, as is done with canoes of elm bark. They then put in cross bars to hold it and serve as seats, and a long pole, which they lay fore and aft in rough weather, to prevent it from being broken by the shocks occasioned by pitching. *Pouchot,* 2:218

This was the large size used by traders, often turned over as a shelter from the storm.

The birch canoe at once attracted attention from its novelty and perfect adaptation to a forest life. It has often been described and is still an example of the survival of the fittest. On the whole, there is no better early description than that of Charlevoix in 1721, which includes much not found in others. It is fully quoted here:

They extend the pieces of bark, which are very thick, on flat and extremely thin timbers of Cedar-wood. All these timbers from head to stern, are kept in form by little cross-bars, which form the different seats in the canoe. Two girders of the same materials, to which these bars are fastened or sewed, bind the whole fabric. Between the timbers and the bark are inserted small pieces of cedar, still more slender than the timbers, and which for all that contribute to

strengthen the canoe, the two extremities of which rise gently, and terminate in two sharp points bending inwards. These two extremities are perfectly alike; so that in order to go backward, the canoe-men have only to change offices. He who happens to be behind steers with his oar, still rowing at the same time; and the chief employment of he who is forwards, is to take care that the canoe touch nothing that may break it. They all sit low down, or on their knees, and their oars are a sort of paddles from five to six feet long, commonly of maple. But when they are obliged to stem any strong current, they are obliged to make use of a pole, and to stand upright, and this is called *picquer le fond,* or piercing the bottom. They must be well experienced to be able to preserve their balance in this work, for nothing can be lighter, and consequently easier to overset, than these vehicles, the largest of which, with their whole loading, do not draw above half a foot water. The bark of which they are built, as well as the timbers, are sewed with the roots of fir-trees, which are more pliant, and less apt to dry than the osier. All the seams are gummed within side and without, but they must be examined every day, to see whether the gum has scaled off. The largest canoes carry twelve men, two and two, and four thousand weight, or two tons. Of all the Indians, the most expert builders are the Outawais, and in general the Algonquin nations excel the Huron Indians in this trade. There are few French who can make a canoe even so much as tolerably well, but in conducting them, they are at best full as sure to trust to as the natives, as they exercise themselves at it from their infancy. All these canoes, the smallest not excepted, carry sail, and with a favourable wind make twenty leagues a day. Without sails you must have able canoe-men, to make twelve in still water. *Charlevoix,* 1 : 294

Alexander Henry, the trader, going up the St Lawrence in 1761, used a very small birch canoe, 16 or 18 feet long. There were smaller ones, but this was the usual size for the smaller lakes and rivers. The larger ones, called northwest canoes, were employed by the traders for the long traverses and great lakes. These were from 30 to 35 feet long, 5 feet wide and 2¼ feet deep, carrying 6000 pounds, beside the crew of 8 or 10 men, two of whom could carry it over a portage. *Henry,* p.9

In New York such canoes would be used only on Lake Ontario and Erie and thus are but incidentally considered here, but Mr Henry mentioned some particulars worth quoting on the general subject:

To each canoe there are eight men, and to every three or four canoes, which constitute a *brigade,* there is a *guide* or conductor. Skilful men, at double the wages of the rest, are placed in the head and stern. They engage to go from Montréal to Michilimackinac,

and back to Montréal again, the middle-men at 150 livres and the end-men at 300 livres each. The guide has the command of his brigade, and is answerable for all pillage and loss; and in return, every man's wages is answerable to him. This regulation was established under the French government. *Henry,* p.14

The ordinary canoe from Albany to the seacoast was the dugout, and this was used in New England. Roger Williams described how independently a man fashioned this:

I have seene a Native goe into the woods with his hatchet, carrying onely a Basket of Corne with him, and stones to strike fire when he had feld his tree (being a *chestnut*) he made him a little House or shed of the bark of it, he puts fire and followes the burning of it with fire, in the midst in many places; his corne he boyles and hath the Brooke by him, and sometimes angles for a little fish; but so hee continues burning and hewing untill he hath within 10 or 12 dayes (lying there at his worke alone) finished, and (getting hands) lanched his Boate; with which afterward hee ventures out to fish in the Oceane. *Williams,* ch.18

In what is considered the earliest view of New York city in 1635, attributed to Augustine Hermann, is a strange form of the dugout which may possibly be the artist's fancy. It is a long boat, manned by five men, which has sloping ends rising far above the sides. From the highest point are long horizontal projections, terminating in large balls. There are smaller canoes of a common type. Figure 27 shows this form from an engraving of 1673, precisely like the former, but propelled by women. The figure is entitled *Navis ex arboribus trunco igne excavata.* No early writer has described this in New York, nor does it at first seem probable that the Indians would have made one of this form. Moulton accepted it, and suggested a fair explanation. He described the earlier figure. There was at each end, he said, "what may be termed a bowsprit finished by a spherical head about the size of a man's. These bowsprits or handles seem an ingenious contrivance for lifting the canoe and carrying it on the land, by two men hoisting it on their shoulders, and thus as on a pole, carrying it from place to place with ease and expedition." *Moulton,* vii

If it were light, two men might suffice, but for a heavier one four men might use crossbars, one at each end, and the balls would pre-

vent these from slipping. When left by the tide, something of the kind might have proved very useful. Pictures and descriptions, however, usually represent a heavy and clumsy boat, useful but neither handsome nor swift, with straight sides and sloping ends, rather a trough than anything else. Capt. John Smith gave an account of these which is much like that of Williams:

These they make of one tree by burning and scratching away the coales with stones and shels, til they have made it in forme of a Trough. Some of them are an elne deep, and fortie or fiftie-foote in length, and some will beare 40 men, but the most ordinary are smaller, and will bear 10, 20, or 30, according to their bignesse. Insted of Oares they vse Paddles and stickes, with which they row faster than our Barges. *Smith, Captain*

It is evident that these would not be carried over land, and their speed argues a better form than pictures show. Whatever the form of the later Onondaga dugout, it differed in some unrecorded way from many used in Pennsylvania. Zeisberger and Frey spent some days at the fishery at Jack's reef on the Seneca river in 1753. Aug. 17 they went with the Onondaga chief "into the woods to find a tree for a canoe." Having found one suitable, they worked at this till the 26th, when they "finished the canoe and launched it; they were much pleased and said that there had never been a canoe of that kind in the neighborhood." As a consequence they had to make a similar one for another chief on their return to Onondaga. They had come up the Susquehanna in one made by themselves, but did not describe its peculiarities.

Figure 86 is a pine dugout of the modern type, quite narrow and of good form. Figure 24 shows the principal features of De Bry's picture of canoe-making in Virginia, slightly altered for convenience of illustration, and giving every process of the work. Dr Charles Rau's translation of his description follows:

Having first selected a thick and high tree, corresponding to the size of the boat they intend to make, they light on the surface of the ground close to its roots, and all around it, a fire, using well-dried tree-moss, and rousing the fire gradually by means of chips of wood, lest the flame might ascend too high and diminish the length of the tree. When the tree is nearly burned and threatens to fall, they light a new fire, which they allow to burn until the tree comes down by

itself. Having then burned away the top and the branches of the tree, in order to give the trunk the proper length, they deposit it on stems laid across forks, at a height convenient for their work; they now remove the bark with a certain kind of shells, and, using the less injured part of the trunk for its lower side, they light on the other side a fire all along the trunk, excepting its ends, and when they think there has been enough burning, they extinguish the fire and commence scraping with shells; having made a new fire, they burn again, and thus continue in succession, alternately burning and scraping, until the boat is sufficiently hollowed out. *Rau,* p.286

An early statement by De Vries follows, regarding canoes on the Hudson river:

Their canoes or boats are made of the bark of trees, and will carry five or six persons. They also hollow out trees and use them for boats and skiffs, some of which are very large, and I have frequently seen 18 or 20 seated in a hollow log, going about the river, and I have myself had a wooden canoe, in which I could carry 225 bushels of maize.

Figure 22 shows an ornamented and angular paddle from Champlain's picture. Figure 89 is from Lahontan and of a different form. Those in the interior were narrower than those near the sea, and often had shorter handles. Lahontan's description follows:

The Oars they make use of are made of Maple-wood, and their Form is represented in the annex'd Cut. The blade is 20 inches long, and four Lines thick. The Handle is about 3 Foot long, and as big as a Pigeon's Egg. When they have Occasion to run up against rapid Currents, they make use of Poles made of Pine-wood. *Lahontan,* 1:28

Figure 94 is part of a paddle which Mr W. W. Tooker had in 1880, from Canoe Place on Long Island. It is of oak and 34¼ inches long. The Onondagas call both paddles and wooden shovels *kah-kah-wēs'-sah.*

John Bartram mentioned a frequent ingenious arrangement for fishing at night, which he saw at Oswego Falls in 1743: "I saw upon one of their canoes in the morning a large piece of bark spread across. On this lay gravel and sand, and on these coals and ashes, which I supposed had been a fire, and the gravel placed there to save the bark. And I took it to be a design both to allure and see to strike the fish." *Bartram,* p.48

Francis Adrian Vanderkemp saw the Oneida Indians spearing eels in this way, when he passed through Oneida lake in 1792. "They are usually two or three in a canoe, one steersman, one who spears in the bow, the third takes care of the fires, made from dry, easily flaming wood, in a hollow piece of bark, first covered with sand." *Vanderkemp,* p.72

The French accounts of this early fishing on the St Lawrence assign two men to the canoe; one to paddle and one to spear. The latter had "a bark torch attached to the prow of his vessel." *Relation,* 1634

Nets were everywhere largely employed, and their stone sinkers are well known. They had an ingenious way of using nets in winter by passing them through holes in the ice. These nets were made of twine prepared from wild hemp. But a few years ago the women of the Five Nations prepared a fine thread of this material, by rolling it on the thigh in the old way. It was everywhere used. On the seashore nets were set at the mouths of bays and creeks at high tide, and the fish were taken when the tide went out. These nets were usually made by old men in New York, and a wooden needle was probably used. The Onondaga name for net was *ah-ah'-á,* to see through. The inner bark of the mulberry, elm and basswood was used for twine and cordage by the Iroquois, but the wild hemp seems to have been the favorite. Of this Kalm said:

Apocynum cannabium was by the Swedes called Hemp of the Indians, and grew plentifully in old corn grounds, in woods on hills, and in high glades. The Swedes had given it the name of Indian hemp, because the Indians formerly, and even now, apply it to the same purposes as the Europeans do hemp; for the stalk may be divided into filaments, and is easily prepared. When the Indians were yet settled among the Swedes, in Pennsylvania and New Jersey, they made ropes of this apocynum, which the Swedes bought, and employed as bridles, and for nets. These ropes were stronger, and kept longer in water, than the common hemp. . . On my journey through the country of the Iroquese, I saw the women employed in manufacturing this hemp. They made use neither of spinning-wheels nor distaffs, but rolled the filaments upon their bare thighs, and made thread and strings of them, which they dyed red, yellow, black, etc., and afterwards worked them into stuffs, with a great deal of ingenuity. *Kalm,* 1:412

Of this art among the Iroquois De la Potherie said: "The old men and those who can not or do not wish to go to war or the chase, make nets and are fishers. This is a plebeian trade among them. Their nets are made of thread of nettles or of white wood, the bark of which they make into thread by means of lye which renders it strong and pliable. *De la Potherie*, 3:33. It is to be noted that the white wood of early writers was commonly that now called basswood.

Fish weirs were also used by the Iroquois, usually formed of long lines of stones in which sticks and branches were placed, terminating in a rude box. These fishing places were assigned to sections of the nations. Wood entered into fishing in other ways. Father Bruyas mentioned some of these. Fishing with the hook was *gagatotsienton*, "to fish by drawing up the fish, as the Mohawks did with the herring." *Gaihonhenton* was "to fish in the fashion of the Oneidas, who chase the fish" through hurdles into a pound. *Atatokwisaon* was "to fish with a basket" in a stream. *Ganniero* was also "to fish for little fish with a basket."

Mr Morgan is the only one who has figured or described the basket used, but any large and deep basket might answer. The writer has taken minnows for bait in the same way. Figure 97 is a general reproduction of Mr Morgan's picture of the "*Yont-kä-do-quä*, or Basket Fish Net." He said:

> The basket net was made of splint in a conical form, about 3 feet in length, 15 inches in diameter at the mouth, and 6 at the small end. In using it, the fisherman stood in the rapids of the creek or river, where the water rippled over the stony bottom, and with a stick or rod managed to direct the fish into the partly submerged basket, as they attempted to shoot down the rapid. When one was heard to flutter in the basket, it was at once raised from the water, and the fish was found secure within it. *Morgan*, 2:42

This was once easily done; but it is probable that two persons fished together, and that a judicious use of sticks and stones helped guide the fish to the basket. Fish were often driven into the weirs by stretching a grapevine across a river and drawing it along the bottom. The Oneidas made a pound by placing two rows of stakes across a creek. The upper one had an opening through which the

fish were driven. This was closed behind them, and they were speared in the inclosure.

The Onondagas also used a fish basket made like our lobster pots, and perhaps derived from them. When the fish had entered, the inside projections prevented its return. This basket was called *ka-ah'-he.*

Miss Powell said in her letter about the Indians at Buffalo creek in 1789: "We saw some of the squaws employed in taking fish in a basket. A gentleman of our party took the basket from one of them, and attempted to catch the fish as she did, but failing, they laughed at his want of dexterity." *Ketchum,* 2: 94

Household articles

Though the Indian's house was not large, and his housekeeping was simple, he had more articles of convenience than we might suppose, reckoning only those of wood. Chairs and tables he ignored; but food was more important than position, and in the preparation of this the wooden pestle and mortar had an old and prominent place. The stone pestle had little use in New York 300 years ago, though not discarded. Among the early illustrations of Champlain's travels is one of a Huron woman pounding corn in a wooden mortar. There may be a hidden expansion of the pestle, but, so far as appears, it is a cylindric stick of uniform thickness, while the present Iroquois pestle expands toward each end. The French missionaries to the Hurons had a handmill, but found the meal made in the mortar better than that from the mill.

The Iroquois wooden mortar is about 2 feet across and a little higher, a section being cut from a tree trunk of suitable size. This is set on end and is excavated by burning and scraping even now. The pestle is about 4 feet long, constricted along the middle and then expanded toward each end in a narrowly elliptic form. Two persons can pound together with alternate strokes, which is the favorite way. Figure 100 shows two Onondaga women thus employed. One may use the pestle alone. The Senecas call this mortar *ga-ne'-ga-ta;* the Onondaga word *ka-ne-ka'-tah* is almost the same. Figure 56 shows both pestle and mortar. The Onondaga name of the former is *ate-hā-tok'-wah.*

After the corn was pounded, two more utensils were required, a sieve and a tray or bowl. Mr Morgan gave a picture of the former used by the Senecas in the preparation of parched corn. After parching and shelling, he said this splint sieve "was used to sift out the fine ashes which might adhere to the kernel." Figure 35 shows what he called "*Yun-des-ho-yon-da-gwat-ha,* or Pop-corn Sieve." For sifting corn meal the Onondagas have one called by them *one-wakt'-hah,* thing to shake with. Figure 45 shows a common Onondaga form. It is merely a rectangular shallow basket, with small openings in the bottom. The final sifting is in the bark tray. The meal is shaken in this, and the light and coarse refuse is blown away. The Onondagas also use a deep and narrow basket for washing the corn after it is hulled. It is about 15 inches high and is called *a-nen-ō-hite'-ah.* Figure 67 shows one of these. Parched corn meal, called *psindamun* or *cittamun* by the Delawares, was in high esteem among all Indians. It was carried in a bag on journeys, and a little of it sufficed for a hearty meal when mixed with water.

The bark tray is less used than when Mr Morgan wrote, but is often found yet. Figure 46 is an Onondaga tray, called *kah-oon'-wah,* and of moderate size. This kind is used in sifting meal, as described. Morgan gave the Seneca name as *ga-wo-o'* and said it would hold from 1 to 10 pecks. Those seen by the writer are of the smaller size, made of elm bark, rounded and gathered up at the ends. The one figured is 23 inches long and nearly as wide. A border of hickory is stitched around the edge, and the tray is durable and convenient. The bark bowls out of which Bartram ate at Onondaga, may have been small vessels of this kind.

Bark dishes were mentioned at an early day, almost everywhere, though all often ate out of the large vessel in which the food was cooked. In a description of Algonquin feasts in 1626, we are told that "at these feasts they give to each one his share in the dishes or porringers of bark." *Relation,* 1626. When they sang, their accompaniment was "striking with their spoons or with their sticks on their bark dishes, or some other thing." *Relation,* 1642. In Canada each guest took his dish and spoon with him to a feast.

In 1675 John Josselyn wrote of the finer class of bark articles, such as once were common in New York, and said:

Delicate sweet dishes too they make of *Birch*-Bark, sowed with threads drawn from *Spruse* or white *Cedar*-Roots, and garnish'd on the outside with flourisht works, and on the brim with glistering quills taken from the *Porcupine,* and dyed, some black, others red, the white are natural, these they make of all sizes from a dram cup to a dish containing a pottle. *Josselyn,* 23:307

Such works of art may not have been used for ordinary meals and may have been too elegant for state occasions. As receptacles of ornaments they filled a need, but bowls and spoons had continual use. Van Curler found them among the Oneidas in 1634. From time to time a large kettle was brought in for the council, in which food had been cooked in another place:

If we happened to be in the house we received a basinful of food; for it seems to be the rule here that every one that comes here has his basin filled; and if there were basins short they brought them and their spoons with them. They sit side by side, and the basin, when empty, is taken and filled again. *Wilson,* p.95

The Canadian Algonquins used to cook in bark dishes, which they called *ouragana,* but had changed these for brass kettles before 1633. A writer of that year was surprised that these bark vessels were not burned. They told him that they placed the flesh and water in the dish, heated some stones, and cast them into the water, one by one. If they lost their kettles, some went back to the old way. These were used in New York at an early day.

In 1630 the Rev. Mr Higgeson mentioned "trayes, spoones, dishes, and baskets" among an Indian's household effects. Daniel Gookin is more explicit regarding the New England Indians, while his remarks will apply to those in most of New York:

Their dishes, and spoons, and ladles, are made of wood, very smooth and artificial, and of a sort of wood not subject to split. These they make of several sizes. Their pails to fetch their water in, are made of birch bark, artificially doubled up, that it hath four corners and a handle in the midst. Some of these will hold two or three gallons; and they will make one of them in an hour's time. From the tree where the bark grows, they make several sorts of

baskets, great and small. Some will hold four bushels or more: and so downwards to a pint. . . The baskets and mats are always made by the women: the dishes, pots and spoons are the manufacture of the men. *Gookin,* 1:151

John Josselyn adds this to the list already given: "Buckets to carry water or the like, large Boxes too of the same materials, dishes, spoons and trayes wrought very smooth and neatt out of the knots of wood, baskets, bags and matts woven with *Sparke,* bark of the *Lime*-tree and rushes of several kinds, dyed as before. *Josselyn,* 23:307

Loskiel said of the New York Iroquois: "They make their own spoons, and large, round dishes of hard wood, with great neatness. In eating, many make use of the same spoon, but they commonly sup their victuals out of the dish." *Loskiel,* 1:54

The writer has several fine Iroquois spoons, which in their general form and the projection at the back and top of the handle suggest Eskimo forms, but has seen none where the bowl so nearly forms a right angle with the handle as in two figured by Morgan. One of these has a bear seated on the upper projection, and the other a group of human figures. One more near the usual angle has two men wrestling. A fourth has a bird at the top of the handle. Two of these appear in the new edition of the *League of the Iroquois,* and all four are included in Mr Morgan's report on the State Cabinet in 1852.

These figures being now accessible, the writer illustrates only some of those found at Onondaga, merely describing the larger and plainer examples. To these are added a few imperfect ones found in graves. The Onondaga name is *ah-to'-quat* and the Seneca *ah-do-qua-sa̋.* The Toronto collection has several taken from graves.

Figure 102 is of medium size, with a well carved group above. A slender animal, like a monkey, is holding down a bird. Figure 103 is shorter and the bowl narrower than with most. The design is a sleeping goose, which seems a favorite. It is of curled maple like many others. This is in the writer's collection and came from Onondaga. Like many modern examples, it has an angular expan-

sion in the handle above the bowl. A small one in the same lot has the lateral edges of the bowl parallel, from wear or original design.

Figure 101 is a fine specimen, of the same material and in the same collection. It is deeper than most and has no expansion in the handle. Part of the bottom is flattened. The carved figure above is quite spirited and represents an Indian lying on his back, holding a large bottle with both hands. From this he has just taken a drink with evident enjoyment, having half emptied the bottle at least. This was made at Tonawanda, though obtained of an Onondaga chief. All these are represented of actual size and were probably made within a century.

Figure 110 is another belonging to the writer, a front view being given that the full width of the bowl may be seen. At the top is a crow with the head turned back. Figure 150 is a recent one, made at Onondaga a few years since. It is very slender, and the narrow bowl has the general proportions of an ordinary teaspoon, but with the sides nearly parallel. It is 7 inches long, and the well carved owl at the top of the handle is nearly 2 inches long. This is an unusual form at Onondaga, where the earlier forms are still made. Not very long ago an old Indian there continually carved them, keeping an immense wooden bowl full for customers. They are stained with a native dye of hemlock bark. It is said that the wood was boiled before carving, thus cutting more easily. They are always dark and well polished by use, and the larger ones are now often used in making butter. Small ones were made for children. Morgan mentions carved wooden pitchers, but the writer has seen none of these. A curved knife blade was used in making spoons.

Another spoon in the writer's collection is 7¼ inches long and has a woodpecker above. A much larger one, 5½ inches wide and 10½ long, has the top but slightly ornamented, terminating in a large duck's head. This also belongs to the writer, who has seen it used at the table by the late Abraham Hill. The bowl is quite flat and apparently once larger, having now an obtuse edge.

Several reduced figures are given of old wooden spoons in the Hildburgh collection, all being from graves in Ontario county, N. Y. Figure 109 is a small one, 3 inches broad and with an unusually wide handle. These old spoons may not have had the carved top, though this is uncertain. This one seems perfect. Figure 106 is of the same width, but has a nearly circular bowl, the handle being apparently slender. Figure 108 is more like the modern form, but with a narrow handle. Figure 107 is a broken one, now 4½ inches long, the handle being wide and angular.

Figure 104 is from another collection and from a Cayuga grave. It is of actual size and shows part of the handle, the bowl being circular and partly split. These early examples are given for comparison, but one approaching a perfect condition. No early writer speaks of carved figures on them, and they may have been quite plain. The first use of the projecting top was for suspension, as by a hook.

With spoons or fingers the Indians ate from a common dish, as the whites once did, and portions were often served in individual dishes or kettles, but the individual spoon was owned and used at a very early day. A Mohawk chief, killed in 1658, was known as *Atogwaekwan,* or Great Spoon, perhaps from the size of a spoon which he had. On the occasion of DeWitt Clinton's visit to Skenandoah in 1810, he said, "a large kettle of corn was boiling, which was the only breakfast the family appeared to have. It was occasionally dipped out from the pot into a basket, from which the children ate." This is the only mention of a basket used for succotash which the writer now recalls, and it may have been of bark or very closely woven. Skenandoah's finely dressed son also ate from this.

The writer found none of the characteristic Iroquois spoons in the National Museum in 1903; but it was a matter of interest that Cherokee wooden spoons had a slight bar above, ending in carved turtle heads. In no others did this feature appear; and the Cherokees were an early offshoot of the Iroquois family. Cherokee spoons have the modern oval bowl, and some St Regis spoons have this feature. A large ladle in that collection has a circular bowl,

9¼ inches across and 3 deep, the handle being 6 inches long and the top curved over but with no animal carving. Another has a narrower bowl, being 9¼ by 7 inches, and is shown in figure 60. The handle is 6½ inches long, curved at the top. In the same collection is a deep and well made tray, 9 inches long and 6 wide. Slight projections at each end serve as handles.

While much grain was put in pits, a great deal was stored in houses. The ears of corn often were, and still are, braided in long ropes, and festooned within and without the cabins. This was an old custom. Mention has been made of the stores of corn which Van Curler saw in Mohawk houses in 1634. He added that the Mohawks made bark barrels. In De Tracy's invasion of the Mohawks in 1666, the villages were found well stored with grain. In De Nonville's expedition of 1687, the Abbé de Belmont said that one Seneca village appeared at "a distance, to be crowned with round towers, but these were only large chests (drums) of bark about four feet in length, set the one in the other, some five feet in diameter, in which they keep their Indian corn. . . There were in the four corners great boxes of corn which they had not burnt."

Mr Morgan has figured and described a bark barrel, but these are now rare, though boxes of the same form and material may be found. In speaking of bark vessels, he said:

> The bark barrel, *gä-no'-quä,* was of the number. It was made of the inner rind of red elm bark, or of black ash bark, the grain running around the barrel. Up the side it was stitched firmly, and had a bottom and a lid secured in the same manner. . . These barrels were made of all sizes, from those of sufficient capacity to hold 3 bushels, to those large enough for a peck. *Morgan,* 2:23

In his figure he calls this "*Gä-snä Gä-ose-hă,* or Bark Barrel," omitting the name given above. The Onondaga word for barrel and pail is *ka-nah'-kwah,* but the latter is also called *a-jen-tuk'-wah,* to dip with. Figure 96 represents one of these receptacles.

Mr Morgan also gives a figure of the bark ladle, or scoop, which he said "was made of red elm bark and would hold but little more than the common spoon." Figure 36 shows this; but these ladles are not now in use.

In most houses the hominy stick is still used for stirring pottage. Mr Morgan called it *got'-go-ne-os-hā'*, and the old Mohawk name has nine syllables. He said it was from 3 feet to 4 feet long, but the common Onondaga examples seen by the writer are not more than half that length. Their name is *ken-sto'-kwah*. Figure 91 shows a large one formerly used on public occasions at the council house, which was about 3½ feet long and well carved. It was long since laid aside. They vary from simple forms to those elaborately worked. Figure 112 is an Onondaga example, 20 inches long. Morgan's figure is of one 4 feet long, cut out of one piece, though "the end piece is attached to the blade by a link. In the end piece are two wooden balls, also cut out of the solid wood within the frame in which they are confined." *Morgan*, 2:45. Analogous to this is his "*Ya-a-go-gen-ta-qua*, or Bread Turner," 6 inches long. These seem rare, and the hominy stick often serves both purposes. Figure 98 is from that given by Morgan. When at hand, the Indian women find it convenient to apply to unruly children, its principal use with some.

For their public feast the Onondagas had a large wooden spoon or ladle, used in dipping out portions from the big succotash kettle. Figure 92 shows this. A carved bird is at the top of the handle, but not in the usual position. This dipper was about 14 inches long, and of generous capacity. A tin dipper has long since taken its place.

Among other things, Morgan figured two corn husk salt bottles, which are now quite rare. Figure 113 shows one of these and figure 114 the other. Figure 111 is an Onondaga example of small size, belonging to the writer, but of basket form. The Iroquois have used salt for about 200 years and say their ancestors were stronger than they because their meat was fresh. The bottles are made of the finest husks.

Corn husks are a well known material for door mats, called *ka-je'-sah* by the Onondagas, something loose or uncombed. Whether these are of early use may be doubted, as they seem made wholly for white people. The Indian mat proper was made as smooth as possible. For a corn-husk mat a long braid is made of

the fine ends, leaving the rough bases projecting and all on one side of the rope. When this is sufficiently long, it is coiled and stitched so as to present a nearly flat surface, rough above and smooth below. The inner bark of the basswood is used in stitching, as common twine is apt to stretch.

Corn husks were once used for shoes, and masks are made of them for special purposes. Corn husk dolls are very ingenious, and one is figured which belongs to the writer. They are usually well clothed, but this would not allow their characteristics to appear. Figure 95 shows this of actual size, but the size varies much. In forming the head, the husk is reversed and drawn very smooth. The whole process is interesting.

Husks are selected at harvest time for various purposes and often kept in store. Braiding these was an early art, applied to the drying and preservation of corn. The husks formed a long rope from which the ears depended, and these were hung within and without the cabin. This is still a feature of New York reservation life. The old Mohawk name for these braids was *onnora*.

Bark mats were made quite recently to lie on, and other mats were important articles in Indian life, but early examples of these are rare from their perishable nature. Mr W. W. Adams found a piece in a brass kettle, holding about 4 quarts and taken from a Cayuga grave. It was "a mat of rushes, woven two strands over and two strands under. In the mat was about a quart of raspberry seeds. It is quite common to find berry seeds in the dishes from this place." These are also found in Seneca graves in small heaps, but without protection. Figure 32 shows a part of this mat, found in the town of Venice N. Y.

Roger Williams's account of mats has been quoted. When Hudson visited an Indian chief, he "scarcely had his head under the roof, but he was seated on two mats spread out on the floor." Lafitau had a picture of an orator standing on a mat, and there are frequent allusions to these. They were made of various materials, fine or coarse, and, when these were colored with the brilliant dyes of the country, they were often very handsome. Baskets and burden straps are the survivors of this early industry. These will properly come under another head.

When the Cayuga chief spoke at Montreal in 1661, on behalf of the Onondagas, he said: "Behold, this is to draw the French to us, in order that he may return upon his mat, which we have preserved for him at Gannentaa, where his house yet remains which he inhabited when he dwelt with us." If a colony of nuns would also go there, "We will prepare them great cabins, and the most beautiful mats of the country are destined for them." *Relation,* 1661

Neatness was hardly an aboriginal virtue; but an early French visitor to Onondaga, in 1655, observed that its streets were very clean when he made his grand entry, though the proverb has it that, the day Rome was unswept, the stranger came. In this case preparations had been made for the French visitor. Nearly a century later Cammerhoff and Zeisberger came to Onondaga, and were welcomed to Canassatego's large house by his wife, who sent for her husband:

> In the meantime the house was being swept, and after an apartment had been prepared for us, we were invited into it, and the one side which was covered with beautiful mats was assigned to us. It was large enough for 6 Brethren to have lodged there comfortably, and was on the same side of the house as Ganassateco's own apartment. A room opposite to us was shown to our Gajuka. *Cammerhoff,* mss.

This was in 1750, but sweeping was then no new Iroquois custom. In the preceding century Father Bruyas wrote the Mohawk word *onhewen,* to sweep, and *jagonhewatha,* a broom. *Onnawenskeri* is another name for more than one of these. Zeisberger preserved a long name for broom; and the present Onondaga name of *kon-wencho-sat'-ah,* or ground sweeper, recalls the primitive floors of bark or log cabins. To place the broom across the door is still the Onondaga way of saying that no one is at home. Beside the early splint broom, a very effective one was made of twigs of hemlock spruce, bound around a handle. Indians and white men alike used this. In the journal of a Moravian Indian village on the Susquehanna in 1762, it was said: "Some sisters went with two horses to gather wood for brooms and baskets."

The splint broom is still made and finds sale in Syracuse. A triangular piece of ash is taken, long enough for broom and handle, and the broad end is splintered in the usual way, as shown in figure 42. When this is done, a groove is cut around the stick, leaving a space between rather longer than the splintered part. This portion is also finely splintered from above and turned back, meeting the ends of the first division as in figure 43. The whole is then stitched with bark thread, and the handle is shaved down as in figure 44.

When a kettle was to be hung over the fire, either from a crane or wooden pole, a simple wooden hook was and is used. Figure 116 shows one of these. A long and slender branch is cut, a fork left near the base serving as a hook. Two or three long sprays at the upper end are bent over into a loop, and their ends are braided around the main stem lower down. It is quickly made and is quite durable. In summer there is still much outdoor cooking.

The corn meal stirrer has been mentioned. An article much like it is the sugar spoon. This is more slender and is perforated in the center of the broad part. When dipped in the boiling syrup, this is blown on opposite the orifice, and the progress of the work is at once seen.

The primitive Indian ladder was very simple. The trunk of a tree with the branches lopped off sufficed. Such was the noted "Indian Ladder" over the Helderbergs, whose name still remains. A tree was often left in the center of a fort, prepared for easy climbing and outside observation. An inclined sapling or post with notches answered well for a house or defensive wall. Such were the ladders of which Champlain and others speak. Figure 120 shows a post or stationary ladder from an Onondaga cabin, which is yet preserved. It is 8 feet long, and one side is smooth. On the other, six notches are irregularly but smoothly cut. This was set up at a slight slope, and served a good purpose, but is now rarely seen. It was used by some of our pioneers also in their log cabins.

Father Bruyas gave two Mohawk words for ladder, *jerathenstha,* derived from the act of climbing, and *kannegota,* which seems its proper name. Words are derived from it to signify taking it up, drawing it back and laying it down, for this was movable. The Onondagas call it by its old name of *ah-tonc'-ah.*

As the early Indians in Canada and New York used no salt, the modern wooden salt cellar, figure 48, had no place among them. White men living among them in the 17th century sometimes did without salt for years; and, when the Onondagas brought Father Le Moyne to the salt spring at Onondaga lake, they thought a demon dwelt in it. The Onondagas call the salt cellar *a-jik-ha-tuk'-wah,* salt box, and their name for the mineral means sour. Bruyas, in his Mohawk words of the 17th century, gave none expressly for salt, but recognized its use, as in *Takkiosiston,* Give me salt.

Gutters or conductors of bark entered into the household economy, but in a limited way. Champlain told how rapidly these discharged water on his fires at the Oneida fort of 1615. They were also employed in conducting the water from the spring around the Seneca fort in Victor. This was destroyed in 1687. It is probable these discharged into wooden reservoirs at convenient intervals. So obvious an aid would not be overlooked by a people sparing of personal labor, and they may have been an unnoted feature of many bark cabins. So Bruyas gives not only *atsannhon,* to let water fall drop by drop, but *atsennhonnion,* a quantity of gutters.

Two charred articles from an Indian fireplace in Jefferson county were obtained by Mr R. D. Loveland of Watertown. Figure 38 is one of these and suggests the body and head of a wooden doll. The accidental fracture on the face adds to this impression, but was made in charring. The length is 1⅝ inches, the edges are chamfered and notched, and the outline is perfect. Figure 37 is an inch wide by $1\frac{5}{16}$ inches long, is rectangular and flat, and has three edges chamfered. There are cross cuts in the center on both sides. They are the oldest New York Indian household articles of wood known to the writer, the charring having preserved instead of destroying them. The handle of a stone axe may be older.

Land travel and transportation

The numerous lakes, rivers and streams of New York enabled the Indian to travel easily and swiftly in his light canoe, even with considerable freight. For land carriage and travel he had long to depend on his own limbs. This necessity led to some ingenious de-

vices. In the deep snows of winter the snowshoe became a great aid, but nothing helped his feet in summer. As soon as possible, he availed himself of the horse, though it never became to him what it was to the prairie Indian. Wentworth Greenhalgh rode to Canandaigua and beyond on horseback in 1677; Colonel Romer rode to Onondaga in 1700; less than 50 years later parties of horsemen came there from Pennsylvania. By that time the Iroquois had horses, and probably much before. When Canassatego and his chiefs came to Lancaster Pa. in 1744, Witham Marshe wrote: "The deputies of the Six Nations, with their followers and attendants, to the number of 252, arrived in town. Several of their squaws, or wives, with some small children, rode on horse-back, which is very unusual with them." *Marshe, 7*: 178

He noted also that "they placed their cabins according to the rank each nation of them holds in their grand council. The *Onondagoes* nation was placed on the right hand and upper end, then the others according to their several dignities." Roger Williams noted their desire for horses in New England. At the close of the colonial period the Senecas had many horses, and Mr Morgan represented a saddle of the 19th century, called *ah-da'-da-qua.* At present all prefer driving to riding.

Snowshoes vary much in construction; but New York forms are usually a light frame, covered with a network of sinews or leather. The frame is pyriform in outline, usually not quite 3 feet long and nearly half as broad. The network, which has apertures about an inch across, covers all but a short space near the front, where the foot is fastened, allowing the toes to turn down when the heel rises. Fig. 2 is from an Onondaga example, 4 feet long. Mr Morgan has a good figure of a snowshoe, which the Senecas call *ga-weh'-ga.* The Onondagas term it *tă-yūn-twen-ky-en-tŭk'-wah,* putting a board on the foot.

Among the Hudson bay Eskimos the Nenenot use four kinds of snowshoes, the swallow tail, beaver tail, round end and single bar. All these have network, but vary in outline. Those of Little Whale river are of a long oval form and made of flat spruce boards. These are used in soft snow. Bruyas may allude to something like this,

when, after giving *gahwengare* as snowshoes in Mohawk, he speaks of going to cut some. Charlevoix described Canadian snowshoes in these words:

They are about three feet long and from 15 to 16 inches in their extreme width. They are of an oval shape, except that the hind part terminates in a point; there are small bits of wood placed crosswise 5 or 6 inches from either end, which serve to strengthen them, and that on the forepart is as it were the string of a bow, under an opening in which the foot is inserted, and made fast with thongs. The tissue or covering of the snow-shoe is made of straps of leather two fingers broad, and the border is of a light wood hardened in the fire. *Charlevoix,* 1: 335

Prof. Otis T. Mason speaks of the Eskimo snowshoe, made "of two pieces of wood bowed and lashed together at the ends in lenticular form." He adds that, "in the Iroquois and Sioux country, and also among the voyageurs, the two-part frame reaches its perfection, being neatly made and gracefully turned up in front." *Mason,* p.383. The reference is not to the Iroquois of New York, but of Canada. He adds something on the range:

The snowshoe line southward is on the isotherm of northern New York. There was abundance of raw material for making them, and the question was one of demand. If the snow was too soft to sustain the wearer, it mattered not how deep it lay, that only made matters worse. There was also a northern limit of good snowshoes. It lay within the Arctic circle, where the snow became hard enough in the long winter nights to sustain the hunter without them. *Mason,* p.383

At present snowshoes are almost unknown on the Onondaga reservation, while at St Regis they are seen in almost every house: yet the Onondagas used them freely in early days, on long hunts or on the warpath as well as at home. In Pennsylvania they were not so constantly on hand. Thus in the journal of a Moravian Indian town there, Feb. 1, 1753, it is said: "Our young folks made snowshoes, as the snow is so deep no one can go beyond a mile of the town." The Rev. Charles Wooley, writing in New York about 1678, described the broad snowshoes which the Indians used in deep snows, traveling "without sinking in the least." This might have been told him, though he met the Indians familiarly.

Charlevoix mentioned the aboriginal sled in Canada, but there is no record of this in New York for transportation. Invention there found other means of making burdens portable. The basket, of course, had a foremost place, and its use in fishing has been mentioned. Ordinarily it contained many articles, large and small, and its size was in proportion. When young, the writer often saw Onondaga women with huge baskets on their backs, out of which sometimes peered the faces of one or two children, hemmed in by other things. The long burden or basket strap, drawn across the forehead, easily held them in place. Within a few years he has seen a squaw passing between two rows of corn, plucking the ears on either hand, and throwing them over her shoulders into the basket. Only the older women now carry the basket thus, and they but rarely. The Onondagas call it *ka-ah'-sah*.

The subject of native basketry has attracted much attention of late, and several valuable works treating of this, have been published. The most elaborate of these is by Prof. Otis T. Mason, issued by the Smithsonian Institution and entitled *Aboriginal American Basketry*. All classes of baskets, and all parts of the country are systematically treated in this work, and the absence of eastern specimens is conspicuous. It is probable that these never rivaled western baskets, and yet there were early examples here of some artistic merit. Gookin described New England baskets, large and small, made of rushes, coarse and silk grasses, corn husks, wild hemp and the bark of trees. "Many of these are very neat and artificial, with the portraitures of birds, beasts, fishes and flowers upon them in colors. Coiled basket ware has been attributed to the early Ojibwas and other Algonquins. Some early patterns have been reclaimed from impressions on New York pottery. Professor Mason says:

All along our northern border and in many parts of Canada the Iroquois and Chippewa now fabricate baskets from the ash, birch, linden, and other white woods, and the vernal or sweet grass (S a v a s t a n a o d o r a t a). The method of manufacture is universally the same; it is the plainest in-and-out checker and wicker weaving. The basketry is far from monotonous, however, for the greatest variety is secured by difference of form, of color, of the relative size of the parts, and of ornamentation. In form the baskets run the whole

gamut as among the Haida and Makah, guided by the maker's fancy and the demands of trade. These Indians all live on the border of civilization and derive a large revenue from the sale of their wares. The colors are of native manufacture—red, yellow, blue, green, alternating with the natural color of the wood. To begin with the rudest, let us take a dozen or 16 strips of paper half an inch wide and cross them so as to have one half perpendicular to the other half, woven in checker at the center and extending to form the equal arms of a cross. Bend up these arms perpendicular with the woven checker and pass a continuous splint, similar to the framework, round and round in a continuous coil from the bottom to the top. Fit a hoop of wood to the top, bend down the upright splints over this, and sew the whole together with a whipping of splint, and you will have the type basket. Now, by varying the width of the splint used to cover the sides, a great difference of appearance is secured. . . Finally, the Algonkin, as well as the Southern Indians, have learned to decorate baskets with a great variety of rolls, looking much like the napkins on the table of a hotel. The weaver draws a splint under the warp stick, gives it a turn up and down, or two turns in different directions, and draws the loose end tightly under the next warp stick but one. The operation is repeated, forming around the basket one or more rows of projecting ornaments. *Mason, Basketry,* p.373

With so many accessible works on basketry, profusely illustrated, styles of weaving need not now be discussed. In New York modern forms have largely replaced those of early days, and to illustrate present styles would be to represent those having few aboriginal features. Yet it is a favorite Indian industry, largely followed on some reservations, notably at St Regis and Onondaga. On the latter the basket ash has been exhausted in the vicinity, and the material has to be procured at a distance. In early days the Indians would have camped or moved the town there. The wood is cut into suitable lengths, brought home, hammered with an ax or maul till the fibers separate, and then peeled off in long, thin strips. Various dyes are used, commonly before weaving. With the increased fineness of basket work, thinner strips are required, and not long since the writer found an Indian friend using an iron tool with teeth, which insured the desired quality. Sweet grass is also employed for some delicate work. Many handsome baskets are made, and the writer has a pretty one of simple design, woven by a girl four years old. It is all home work; and figure 152 shows an Onondaga basket maker sitting before her door.

Some Indian tribes still use long bone awls in making baskets. These are the large ones, retaining the joint at one end; and it is probable that the early Iroquois used these in weaving mats and the finer baskets. Professor Mason adds:

Twined weaving was common throughout the Middle and Eastern states of the Union in prehistoric times. Fabrics of this class were employed by the ancient potters in nearly all of the states. Every variety of twined weaving known to the modern Indian was practised by the old time people—the mound builders especially.

The burden or basket strap is more characteristic and was indispensable at an early day, though now becoming quite rare. Mr Morgan gave a good figure of this, with its Seneca name of *gus-ha'-ah,* in Onondaga, *kas'-ah.* His remarks on this are quoted:

The burden strap is worn around the forehead and lashed to a litter, which is borne by Indian women on the back. It is usually about 15 feet in length, and braided into a belt in the center, 3 or 4 inches wide. Some of them are entirely covered upon one side with porcupine quill work. . . The braiding or knitting of the bark threads is effected with a single needle of hickory. In other specimens, the quill work is sprinkled all over the belt for ornament, the quills in all cases being of divers colors. *Morgan,* 2: 16

The foundation was of elm bark twine, but wild hemp was often used. He had one made by an Onondaga in Canada, adorned with colored moose hair, woven in regular patterns on the upper surface of the strap. White, red, blue and yellow were used. This was called *o-ă-ta-ose-ka.* Elk and deer hairs were also used. For wider illustration, the writer figures some Onondaga examples which are not so long or handsome.

Figure 122 shows most of the ornamented part of one. The ground is black, tapering both ways into the narrower and long extremities. These look like buckskin, but are of elm bark. The beads on the edge are white. The first diamond on the left is white with a green center; the other white with a red center. The sloping bar is of white, red, green, red and white lines. The straight bars are of white, red, green, red and white lines also. Another strap had geometric patterns of red, white and blue, running lengthwise, and was more elaborate. They are often perfectly plain. Figure

124 is Aunt Dinah's burden strap, and is of alternate flaxen and purplish hues, being 5½ feet long. It belongs to the Onondaga Historical Association.

Both strings and ropes were made of elm bark, and figure 51 shows one of the latter, called *an-hye-ach'-hah* by the Onondagas. Fine bags were made of this. Clark thus describes one in which the wampum belts were kept at Onondaga:

> The bag which contains these relics is of itself a singular curiosity. It is made of the finest shreds of elm bark, and a person without being apprised, might easily mistake it for the softest flax. Its capacity would exceed a bushel. This bag is reputed to be as old as the league itself, and certainly bears the marks of great antiquity. *Clark,* 1 : 125

The writer examined this 30 years later, and it was as well preserved as in Clark's day. It might have lasted to this time had it not been cast aside when the belts were dispersed at Thomas Webster's death. To make it coeval with the league is a mere fancy.

Quantities of the inner elm bark are kept for use, after having been boiled in lye, sometimes in loose masses and sometimes braided, as in figure 49. Out of a mass of this at Onondaga, the writer took a small piece for illustration in figure 50. It easily separates into very fine filaments and is quite strong. The straps are woven in many ways, and a blind Onondaga woman was very skilful at this work, some of which remains.

White men sometimes used the burden strap. When Cammerhoff went from Onondaga to the Senecas in June 1750, he said: "We had no straps for carrying. David went out and procured some inside bark, and with it manufactured a pair as well as he could. Thus we were able to carry our bundles." *Cammerhoff,* mss

These were not so good as those the Indians made, as they found when they came to Cayuga: "We bought a pair of straps for carrying from our Gajuka's mother, as ours of bark would not answer well, and our baggage had grown heavier. . . David had a great load to carry, between 50 and 60 pounds, and besides his gun and powder and lead." *Cammerhoff,* mss

Belonging to this was the burden frame, sometimes called the litter. It was an early and ingenious means for carrying loads of almost any kind. After a battle the wounded were placed in these, and Champlain graphically recorded his experience after the attack on a fort in 1615:

> They began to prepare litters to convey their wounded, who are put in them, tumbled in a heap, doubled and strapped in such a way that it is impossible to stir; less than an infant in its swaddling clothes; not without considerable pain, as I can certify, having been carried several days on the back of one of our Indians, thus tied and bound, so that I lost all patience. As soon as I had strength to bear my weight, I got out of this prison, or to speak plainer out of hell.

The great soldier and explorer was no light weight, but fortunately the strap and frame were even stronger than his words.

Mr Morgan gave a good picture and description of the burden frame, called *ga-ne-ko-wa'-ah* by the Senecas, and *ont-ha-nah-ka-tast'-hah* by the Onondagas. It is usually plain and has two hickory or elm bows, each bent over like the back of a chair, and these are brought together at right angles when in use. Cross bands of elm bark keep these in position, strengthen the frame, and also furnish hinges, so that it may be folded. To this frame the strap was attached, passing over the forehead, the long ends being used to secure the load. Figure 125 is an Onondaga example of the ruder kind, nearly 20 inches high. The strap is omitted. Figure 117 is another, more elaborate and modern, folded in the illustration. It belongs to the Onondaga Historical Association. One part has a light board frame, and the other has rods instead of bark.

Baby carriages are now much used by the New York Iroquois, but the Indian cradle still survives and is in frequent use. The Onondagas call it *kah-ah-hōn'-sah*, and from the odd resemblance they give the same name to Jack-in-the-pulpit. Some yet used are as much as 60 years old. Figure 41 shows the back of an Onondaga cradle, 30 inches high and 14 inches wide at the top. The burden strap is 8 feet long and 2½ inches in extreme width. This is attached to the crossbar near the top. Thongs pass through the board.

Prof. O. T. Mason has found no cradle boards among the Eskimos, in Mexico or tropical America. He says:

The American aboriginal cradle is influenced by climate. It can not exist in extremes of heat or cold. In the one case the child would be smothered, in the other it would be frozen. Again, whatever may be the material, whether birch bark, rawhide, a flat board, a dugout, a frame of rods, the infant's head is never placed in contact with it. There is always between the head and this hard frame or board a pillow of fur, hair, shredded bark, down or some other substance. *Mason,* p.500

But three New York examples are in the National Museum; and he described one of these from St Regis. The back is carved to represent peacock feathers and is brightly painted. It is square at the top and has a movable foot rest. The length is 29¼ inches, top width 10½, and bottom 8⅛ inches. At St Regis white men make these for the Indians. Another was 31 inches long.

Morgan called the cradle *ga-ose'-hă* and gave a figure with the child swathed in belts of beadwork, now rarely used. The writer has photographed several Onondaga children on the boards, but the wrappings were quite simple. Morgan's cradle was 2 feet in length, 14 inches wide, with a carved foot board, and a hoop or bow near the top, extending a hood over the child's head. It is hung up or carried by a cord. One of his figures shows the simple frame. *Garhon* was the early Mohawk name.

Figure 126 is an Onondaga example, made by Harry Webster and now about 70 years old. It is 27 inches long, and the little bed is ready for use. Figure 127, *a, b,* shows some of the carving of actual size. As much depends on personal taste, cradles vary much in this and other details, while essentially the same. The child is laid on the cushion, the wraps are fastened around, and then it can be carried, set against a wall or hung on a bough. Figure 99 shows an Onondaga child as one usually appears now when held by the mother. Fig. 149 shows the well carved and brightly painted back of a cradle belonging to the writer. The length is 32 inches and the breadth 1 foot. Though bought at Onondaga and said to be 50 years old, it may be from St Regis; but the Onondagas say they formerly made those like this. The birds and beasts are quite good, and many colors

were used in painting it a second time. The hoop for the hood is also carved as usual.

In Canada these cradles were briefly described in 1611 and often after, but not at much length, and in New York and New England the early writers took little notice of them.

Bruyas gives the Mohawk word *gaon,* meaning a bark fan, but without description. In making maple sugar a bark vessel was used for collecting and carrying the sap. Figure 33 shows one of these. Part of the outer bark was removed, and the ends were formed by turning up the inner bark. The Iroquois feast of the maple was the earliest of the spring.

A staff, often finely carved, might be used by an old person. Old Aunt Dinah seldom appeared without one, and one 5½ feet long was made for a kind lady whom the Onondagas much admired. It was well carved and proved useful in climbing the hills in her mission work. Another had on it the word *Onondaga,* the council house, three Indians joining hands on one side of this and three white men on the other.

Ceremonial articles

Sticks or poles always had and still have a prominent place in councils, for the better exhibition of wampum and presents. In the condolence council the ceremonial wampum is hung on a stick, and removed and returned a bunch at a time. The wampum sent out to call a council has a small stick attached, on which notches are cut, one for each day before the council. The recipient cuts away a notch daily and thus preserves the date. The writer has a string of white wampum, calling a religious council, and on the accompanying stick the notches had been cut and removed. Figure 93 shows this of actual size. Bruyas called the dry message stick *gahwengare.* An Indian friend of the writer had lost her son. She had a long stick on which she cut a notch every day, a cross cut for Sunday, and thus easily numbered the days and weeks after his death. When visitors are now welcomed on solemn occasions, a messenger meets them and then records and reports their number on a stick. The Onondagas call the tally stick *osc-sā-tah O-en-nah'-ka,* counts on a stick.

The Hurons placed a limit on story-telling in a similar way:

They present to him from whom they desire to hear any thing, a little bundle of straws, a foot long, which serve as counters, to supply the place of numbers and to aid the memory of the assistants, distributing in different lots these straws, according to the diversity of the things which they recount. *Relation,* 1646

In 1648 the French gave the Hurons "a bunch of sticks tied together, to show the number of presents they required" for a murder committed.

When Father Chaumonot went from Onondaga to the Senecas in 1657, it is said:

His guide presented to him a bit of wood to throw upon two round stones, which they encountered in the road, surrounded by marks of the superstition of these poor people who throw, in passing, a little rod upon these stones in the way of homage, and adding these words: *Kouë askennon eskatongot;* that is to say: Hold, behold this is to pay my passage, in order that I may go on in safety. *Relation,* 1657

Montanus said of the New York Indians that, in agreeing on matters of importance, "they take as many little sticks as there are conditions in their proposals." Sticks were temporarily used by the Iroquois when there was not enough wampum, but were always replaced with belts or strings. Loskiel says they used colored bits of wood before they had wampum.

De Vries gave a curious account of a council he attended in 1643: "There was one among them who had a small bundle of sticks and was the best speaker among them." He spoke, and "then he laid down one of the sticks, which was one point." He spoke again, and "then laid down another stick. This laying down of sticks began to be tedious to me, as I saw that he had many sticks in his hand." *De Vries,* 13, 118

This does not differ from the use of strings, but sticks were often given to persons charged with remembering special parts of an address, and Kalm speaks of cutting notches on a stick for the same purpose. Sir William Johnson, in his letter to Arthur Lee, spoke of another use:

As to the information wch you observe I formerly Transmitted to the Gov^{r} of N. York concerning the belt & 15 Bloody Sticks

sent by the Mississagaes, The like is very Comon and the Ind[s] use Sticks as well to Express the alliance of Castles as the number of Individuals in a party. These Sticks are generally ab[t] 6 Inches in length & very slender & painted Red if the Subject is War but without any peculiarity as to Shape. *O'Callaghan,* 4:437

Sticks were used to point out direction or to indicate the time of day. In the French account of Iroquois customs in 1666 is an illustration, from which figure 64 is taken. The writer said:

A stick set in the ground to the extremity of which two or three pieces of wood are attached, to denote the direction in which they went when they are hunting; and on the nearest tree they paint the animal of the tribe to which they belong, with the number of guns they have. *O'Callaghan,* 1:10

Heckewelder mentions a sundial of this kind:

A clear place in the path is sought for, or if not readily found one is made by the side of it, and a circle or ring being drawn on the sand or earth, a stick of about two or three feet in length is fixed in the center, with its upper end bent towards that spot in the horizon where the sun stood at the time of their arrival or departure. *Heckewelder,* p.131

A still more curious account is in Morse's *Geography,* published in 1795. A Seneca Indian wanted to leave a message for his friends:

He took a piece of wood and hewed it flat and smooth, and then raked his fire for a suitable coal, with which he rudely delineated on the slab the figure of an Indian, carrying a gun reversed upon his shoulder. In front of him he drew a crooked line, which reached to a man with a long coat and cocked hat, and holding a cane in his hand; and behind him a framed house. He then took a straight pole, and tied some weeds and grass upon one end of it, and fixed the other in the earth, in such a manner, that, in the position the sun then was, which was six o'clock in the morning, it cast no shadow—or, in other words, he pointed it exactly towards the sun. The meaning of all was this: "Susquewewah (the name of the Indian) left this spot at six o'clock in the morning, or when the sun was in the place where the pole pointed, and had proceeded up Wood creek, (which is remarkably crooked) to the settlement where the commissioners of the State of New York are assembled to hold a treaty with the Indians." *Morse,* 1:92

The False Faces who throw ashes are called *Hon-to'-ye* by the Onondagas. A paddle is used in doing this on some reservations,

but not at Onondaga now, though Clark speaks of these there at the New Year's feast:

The fire is now extinguished in every cabin, the committee enter the dwellings (the inmates expecting them,) and with a small wooden shovel scatter the ashes about in every direction. The hearths are made clean; new fire is struck from the flint and rekindled; thus they proceed from house to house till every one is visited and purified. *Clark,* 1: 56

Jedediah Horsford gave a similar account in 1816, at Squakie Hill, N. Y., but with a difference. The proceedings of each day were not the same as at Onondaga, and on the second day, he said:

Five Indians appeared with long wooden shovels, and began to scatter fire and ashes until the council-house became filled with dust and smoke. This ceremony was repeated at each house several times during the day, but to a different tune at each round. Speeches, exciting levity, occurred the third morning. About noon the fire-shoveling was repeated with increased vigor. *Doty,* p.54

In Canada the scattering of ashes, or *Ro-non-wa-ro-rih,* is two days after the burning of the white dog, and leaders of the paddle party are appointed. New paddles are distributed to all, which are returned to the master of ceremonies after a song called "tipping the paddle," and other observances.

Idols

In a strict sense idols were not a feature of New York aboriginal life. Most Indians had amulets, charms or medicine, but these were personal and usually out of sight. Perhaps the reverence paid to Christian symbols, or contact with western and southern tribes, may have suggested something more tangible than unseen spirits, present everywhere. They reverenced certain rocks and places at an early day, as being the homes of powerful spirits, and made offerings to these, but a change seems to have come early in the 18th century, affecting the Senecas particularly. The Delawares shared in this: "Their only idol was called, in Delaware, *Wsinkhoalican.* It was the figure of a miniature human head carved of wood and carried about their persons, or cut, life-size, out of a post, and set up in the middle of the house where they sacrificed." *De Schweinitz,* p.96

Loskiel said that the head was put on a pole; and it would seem

that the ordinary wooden mask may have been intended. While with the Mohawks in 1634, Van Curler made this note, apparently of the usual medicine: "The chief showed me his idol; it was a head, with the teeth sticking out; it was dressed in red cloth. Others have a snake, a turtle, a swan, a crane, a pigeon, or the like for their idols, to tell the fortune; they think they will always have good luck in doing so." *Wilson,* p.88

Maj. James Norris, while at Chemung with Sullivan's army, Aug. 12, 1779, said: "In what we supposed to be a Chapple was found indeed an Idol, which might well enough be Worshipd without a breach of the 2d Commandmt. on account of its likeness to anything either in heaven or Earth." *Conover,* p.229. Other soldiers said the same in other places.

The following, from Col. Thomas Proctor's journal of Ap. 3, 1791, is more to the purpose. He was at the village of Canaseder, on a high bluff overlooking the Genesee river, between Squakie Hill and Oil Spring. He said:

In this place was erected a wooden statue, (or deity) fashioned like a fierce looking sage. This formerly they worshiped by dancing before it on certain festival occasions or new moons, looking on it as through a veil or assistant, whereby they pay adoration to the Supreme Spirit, as knowing it hath a form, but not a substance. *Proctor,* 4: 565

At Cornplanter's upper village, Ap. 21, he saw a thanksgiving feast, in which a statue appeared. Due preparations were made:

Thus prepared, they proceed to the statue, which was erected in the center of the village, bearing some proportions to a man, and justly painted as the Indian at its coming, but having no weapon of war about him, intimating that he was the maintainer of peace. This figure is about 9 feet in hight, and stood on a pedestal of about 12 feet, having on breech clout leggings, and a sash over its shoulders, and a very terrible appearance. Under this statue were placed two chiefs, termed the women's speakers; each of these had in his hands the shell of a large tortoise, the belly part covered with a thin skin, stretched very tight, having in the inside several small stones; which shells being struck upon a deer skin which is stretched between them, beating time together, accompanying the same with their voices, they made such melody that the whole of the assembly were delighted. The old and the young women danced around in a circle, the image in the center, the men following them, using

gestures that would have made saints laugh, had he forgotten that he was in a place of worship; but the women looked meek and humble while they moved in concert in the dance, sliding their feet sideways, looking at the same time steadfastly on the ground, inclining their heads to the left. *Proctor,* 4: 578

A larger figure was mentioned in an account of Cold Spring, Cattaraugus co., published in 1841: "A few years since, a portion of the Indians in this town were in the practice of collecting around a log about 30 feet long, worked into a resemblance of the human form, to which they performed a kind of worship. The son of Cornplanter subsequently persuaded them to throw it into the river." *Barber and Howe,* p.83

The large wooden images over the gate of Oneida, in 1634, were probably ornaments. The wooden masks had a different purpose. In all New York the Senecas alone had a worship of this kind, and it was of recent date with them. When dogs were sacrificed, they were often hung on poles for several days, and were conspicuous in some towns in Sullivan's campaign. In colonial times this also seems purely a Seneca custom.

In Col. Daniel Brodhead's report in 1779, he said "at the upper Seneca Towns we found a painted image or War post, clothed in Dog skin," *Conover,* p.308. This may fall under either head, but the Senecas were evidently partial to images. The other Iroquois paid no reverence to them, but did to certain stones. An Onondaga in 1753 brought the Moravians to the Seneca river, "where were two stones, which, he said, had once been an Indian who had been petrified, and these were his head and body. They offered sacrifices to him, so that they might catch much fish, and we found tobacco lying there that they had sacrificed." *Zeisberger,* mss

Musical instruments

The drum was as exciting to the Indian's feelings as to those of his civilized successor, though his was a ruder affair and sometimes quite unlike our own. The Jesuits described one used by the Canadian Algonquins, in these words:

This drum is of the bigness of the drum of Basque: it is composed of a ring three or four fingers wide, and of two skins tightly

stretched from the one part and the other; they put within little stones or little pebbles to make more noise; the diameter of the greatest drums is of two hands-breadth or thereabouts; they name it *chichigouan,* and the verb *nipagahiman.* I have played this drum. They do not beat it as our Europeans do; but they turn and shake it, to make the pebbles sound which are within; they strike it on the ground, sometimes on the edge, sometimes as if a dish. *Relation,* 1634

This was properly a kind of rattle, most rattles being used in this way. In the French account of Iroquois customs in 1666, this name is used in describing Indian pictures. "After the animal are the prisoners they have made, with a *chichicois,* (or gourd filled with beans which rattle), in the right hand." *O'Callaghan,* 1 : 5

The picture is that of a long-necked gourd, still used as a rattle, and called *gus-da-wa'-sa* by the Senecas. The general Onondaga name is *ka-sta-wen'-sah,* and four kinds are in use. Figure 130 is an Onondaga gourd rattle, 12 inches long. The small end is perforated for suspension, and the opening at the large end is plugged after pebbles have been introduced. This is the kind represented in early pictures, as before mentioned. Figure 131 is another, enlarged from Morgan. Figure 119 is an Onondaga bark rattle, cut in a long piece and doubled over. Over the edges of one half are drawn the edges of the other, forming somewhat of a long triangle, over a foot long, an inch wide at the top and about 4 inches wide at the bottom. Pebbles are placed in this, and the opening is corked up as with the gourd. This is very effective, and is an old form now quite rare. The figure is half the actual length.

Figure 1 is less antique, being an Onondaga rattle made from a cow's horn. It has a long wooden handle which passes through both ends, and which is nearly a foot long. It is supplied with pebbles, as is usual.

Figure 121 shows the usual turtle-shell rattle, reduced to one half the length. This was obtained at Onondaga by the writer, and has an extreme length of 12¾ inches. Some are so large as to require both hands. This shell is 6½ inches long and is that of the wood terrapin. The animal is removed, and the head and neck are stretched over a stick which enters the shell. Two hickory splints

reach from the back part of the head, diverging to the central plate on the back. The sharp points penetrate this. On the underside another splint reaches from the lower jaw to the center of the sternum, which it penetrates. Some corn is placed in the cavity, and the orifice is sewed up. Around the splints along the neck a cord is tightly wound. While all these can be shaken like a rattle, they are usually struck against something resonant, as a bench.

Mr Morgan notes one feature of a concert called *o-ee-dose:*

> It was given in the night, in a dark room, and no women were allowed to be present. Those engaged in the concert were seated on benches around the room, in a continuous row, each one holding in his hand a rattle. . . These rattles were made to give each one a different note, by means of different sized shells, and holes bored in them to emit the sound. Among 20 of them, rattled together at such a concert, no two would give the same sound. *Morgan,* 1 : 277

The big turtle-shell rattle is used in the Great Feather dance, and in the medicine dance of the False Faces. It is carried by the chief False Face, and its use is laborious, requiring both hands. This is called *keh-nya-ten-go'-nah* by the Onondagas, and *ka-sta-wen'-sa* may be added for rattle. Smaller rattles were also used. The gourd rattle is called *a-e-tot'-hah ka-sta-wen'-sa,* the first word indicating the medicine dance at which it is used. Horn rattles may be used at any dance; but at a condolence or mourning council all the music is vocal.

The drum was quite a different thing and was called *ka-na-ju'-we* by the Onondagas, or covered kettle. Figure 132 is a small Seneca drum, 3½ inches deep and a little more in diameter. This is unusually small. The single drum-head is drawn tightly over the upper end of a wooden bowl. Figure 133 shows one of the drum sticks, elaborately carved. Mr Morgan gives a figure of a larger and more serviceable one, a foot deep and with a stick like our own. It is merely a small hooped keg, furnished with a leather head. This the Senecas call *ga-no-jo'-o.* At Onondaga the big Indian drum is like a large keg, about the diameter of an old-fashioned churn, and is used in the war and fish dances, the annual feast of the dead in the spring etc., but never in the snake dance. Drums of the size

of small paint kegs, and often made of them, are used in many dances.

The flute is called *so-wen-tuk'-wah* by the Onondagas, with *a* sometimes prefixed. It is often termed the courting flute from its old use. The Senecas term it *ya-o'-da-was-ta.* Figure 52 is taken from Morgan's figure of this. It is 1½ feet long, and his account follows:

> This instrument is unlike any known among us, but it clearly resembles the clarionet. Its name signifies "a blowpipe." It is usually made of red cedar, is about 18 inches in length, and above an inch in diameter. The finger holes, six in number, are equidistant. Between them and the mouthpiece, which is at the end, is the whistle, contrived much upon the same principle as the common whistle. It makes six consecutive notes, from the lowest, on a rising scale. The seventh note is wanting, but the three or four next above are regularly made. This is the whole compass of the instrument. As played by the Indians, it affords a species of wild and plaintive music. *Morgan, 2*: 38

This is now rare at Onondaga, though in use not long since. One examined there was as described above. There was a raised part between the mouthpiece and the hole below; and there were nice bands of lead. The lover used to play a jew's-harp to call the maiden out. A mouth organ is now used.

Figure 115 is a cylindric bamboo whistle, once belonging to Captain George of the Onondaga reservation, and used by him in the annual medicine-making. There is an opening a third of the way from the mouth, and two adjustable pieces are slipped back and forth, over this and under the strings, to get the desired pitch.

When Bishop Spangenberg was at Onondaga in 1745, he noted that "the Indians paraded through the town to the music of a couple of violins, flutes and a drum; and also around the house where we lodged." Violins are now forbidden.

Hunting

Besides their archery the Indians had other devices for taking game, using snares, traps and pounds. Wild pigeons were found in such vast numbers that long poles alone were required to take the young. Bruyas defined *gannhi* as "a great stick with which they

strike the nests of the pigeons." *Ata* was "a little bark or dry wood to serve for torches in the hunt for pigeons during the night." Not 50 years ago the Onondagas fastened pieces of hickory bark on long poles, lit them, and poked down pigeon nests by the light. There are vivid accounts of these scenes.

Snares and traps were common; and the Onondagas call all those for game, *ki-yen'-ton.* Bruyas gives *agarion,* "to make traps for hares;" *askôton,* "to make traps for beaver, bear, etc." These are Mohawk words. Roger Williams gives some of the Algonquin, as *ape' hana,* trap or traps; *wuskape'hana,* new traps, etc. He says: "They hunt by Traps of severall sorts. . . Each man takes his bounds of two, three, or foure miles, where hee sets thirty, forty, or fiftie Traps, and baits his Traps with that food the Deere loves, and once in two dayes he walks his round to view his Traps." *Williams,* ch.27

Sometimes a wolf devoured the deer. "Upon this the *Indian* makes a falling trap called *Sunnuckhig,* (with a great weight of stones) and so sometimes knocks the wolf on the head."

In Turner's *Holland Purchase* mention is made that the Senecas caught wolves in pits, hanging a bait over them from a sapling. This seems doubtful with so agile an animal, but is a pioneer's story. The true account is probably that given by the Onondagas. They bent over saplings with baited nooses attached and also made deadfalls of loaded logs.

In one of Champlain's pictures a wolf and deer appear thus caught, hanging in the air. Mr Morgan speaks of the same thing, and mentions other devices:

> Nets of bark twine were also spread for pigeons and quails. A simple bird trap for small birds consists of a rounding strip of elm bark about 8 inches long by 4 wide, with an eye cut in one end and a piece of bark twine with a noose at the end of it, attached to the other. After the bark is secured upon the ground, a few kernels of corn are dropped through the eye upon the ground, and a noose adjusted around it. When a bird attempts to pick up the corn the ruffled plumage of the neck takes up the string, and brings the noose around the neck, which is tightened the moment the bird attempts to fly. *Morgan,* 2:24

Figure 123 shows this snare. Van der Donck mentioned a snare for taking turkeys:

The Indians take many in snares, when the weather changes in winter. Then they lay bulbous roots, which the turkeys are fond of, in the small rills and streams of water; which the birds take up, when they are ensnared and held until the artful Indian takes up the turkey as his prize. *Van der Donck,* 5: 172

The mode of driving deer between lines of stakes and brush, into a pound or narrow opening, has been often described. The town of Poundridge N. Y. was called after a deer pound of this kind, situated at the foot of a high ridge south of the village of that name. David Cusick described the same thing: "They make a long brush fence and remove the leaves on both sides of the fence, the deer will follow the path; the person can easily kill the game." *Beauchamp,* p.35

Champlain gave both a picture and description of this mode of hunting as he saw it in the Huron country in the winter of 1615–16, but the work must have been great if his estimates are correct. He said:

They went into the woods, near a little forest of fir-trees, where they made an enclosure in the form of a triangle, closed on two sides, open on one. This enclosure was made of great palisades of wood crowded together, of the height of 8 to 9 feet, & in length about 1500 paces on each side, at the end of which triangle was a small enclosure which continually contracts, covered in part by branches. . . They go into the woods about half a league from the said enclosure, separated one from another about 80 paces, each having two sticks which they strike together, marching slowly in this order till they arrive at the enclosure. *Champlain,* 2: 538–39

Then the deer are driven through the converging lines into the pound. The branches keep them from leaping out there, and all are killed. In the Iroquois country deer were so abundant that this was not used, and it seems to have been confined here to the southeastern part of the State. A large, deep and almost circular depression near Unadilla may have served for such a pound. Near the pond in the center stone walls have been thrown up, as though to shelter hunters, and a graded way from above leads to these.

Games

Two or three games were played by most of our aborigines, east and west, but with modifications. Some may be briefly noticed. Among these the Iroquois game of the deer buttons or bones hardly has a place in speaking of the uses of wood, and its mention will be brief. It is more fully treated in the writer's paper on Iroquois games, *Journal of American Folk-Lore* for 1896.

It is a fireside game in which eight bone buttons are used, about an inch in diameter and blackened or spotted on one side. No dish is used, but the buttons are scattered with the hand. From this comes the Onondaga name, *ta-you-nyun-wat'-hah*, or finger-shaker. The Senecas call it *gus-ga-e-sa'-ta*. Two white or two black count two, called *o-yu'-ah*, or the bird. Seven white or black count four, called *o-neo'-sah*, or pumpkin. All white or black gain 20, called *o-hen'-tah*, or a field. *Beauchamp*, 9: 269

This seems to have been formerly played with fruit stones, as another noted game always has been. The latter has a public character and was of high esteem centuries ago. Brébeuf vividly described the game played among the Hurons in 1636, when it was known as that of the dish, because the six peach stones were always shaken in this. Hence the Onondagas call it *ta-yune-oo-wah'-es*, throwing the bowl to each other. Figure 134 shows *kah-oon'-wah*, the bowl, and figure 136 the peach stones. The bowl is that used by the writer, and was made by the chief Ossahinta, nearly a century ago. It is 11 inches across the top, 3 inches deep, and was carved out of a hard knot. The stones have each a white and black side. Five count a bird and six a field, with no lower counts. Morgan called the game *gus-ka'-eh*, and gave a good description.

The Seneca bowl, figured by Morgan, was about the same size and form as the Onondaga one represented. Figure 135 is another Seneca bowl, belonging to J. N. B. Hewitt of Washington D. C., with the peach stones in place. This is but 9⅜ inches wide, and differs from the usual form. Two players place the bowl between them, striking it on the ground or floor. Each plays till he loses, and, when he has exhausted his allotted means, another from the same side takes his place.

Counting sticks have never been mentioned among the Iroquois, and it was not till the summer of 1902 that the writer met with them at Onondaga, connected with the peach stone game. Figure 128 gives two views of one of these, having the base and expanded head painted red. There are several of this form, and with each set goes another, formed like a snake and mottled all over. Figure 129 shows one of these, of the same size as the rest.

Mr Stewart Culin, in his interesting monograph, *Chess and Playing Cards*, describes some counting sticks. Those of the Dakotas and Blackfeet have little resemblance to those of Onondaga, but some from Maine and New Brunswick have a distinct likeness and vary from 5 inches to 8½ inches in length. Some are plain sticks; others are notched in various ways, or have the undulating serpent form. He figured some from the Micmac Indians of Nova Scotia, who used them with the game of the bowl. Of these it is said:

> There are 55 counting sticks—51 plain rounded ones about 7½ inches long, a king pin, shaped like the forward half of an arrow, and three notched sticks, each presenting half of the rear end of an arrow. These last four are about 8 inches long. Three of the plain sticks form a count of one point, the notched sticks have a value of five points, while the king pin varies in value, being used as 52d plain stick, except when it stands alone in the general pile; then it has, like the notched sticks, a value of five points. *Culin*, p.698

In this a woman "keeps the score on the counting sticks, which at first lie together." The Micmacs of New Brunswick use 48 plain sticks and four larger ones. One of these has five serrations on one side, and two have four. The fourth stick is undulated. *Culin*, p.704

Some other Micmac sticks differed a little. The Passamaquoddy Indians had 48 small sticks, nearly 5 inches long, four larger, and one notched. The Penobscots used 55 cedar sticks, 51 being plain and rounded, three flat, and one of a zigzag form. All were about 6 inches long. *Culin*, p.709

Another general and popular game was that of straws, not unlike that of jackstraws, but never mastered by a white man. It has

often been described, but the Algonquins cared more for it than the Iroquois. Charlevoix gave a brief account of this:

These straws are small rushes of the thickness of a stalk of wheat and two fingers in length. They take up a parcel of these in their hand, which generally consists of 201, and always of an unequal number. After they have well stirred them . . . they divide them, with a kind of sharp bone or awl into parcels of ten; each takes one at a venture, and he to whom the parcel with eleven in it falls gains a certain number of points according to the agreement. *Charlevoix, 2*: 102

The game of the snow snake, called *ka-when'-tah* by the Onondagas and *ga-wa'-sa* by the Senecas, is not mentioned by any early writer, and yet seems purely Iroquois in character. It is almost unknown outside of the reservations. The implement is a slender rod, from 5 to 7 feet long, and has an upturned head loaded with lead. Figure 138 shows this part from one belonging to the writer. The lead is run into grooves, and the head is blackened by the heat. Originally no metal was used. The long shaft bends as it runs over the ice or snow, suggesting its common name. The Seneca form is flatter and thinner than the Onondaga. Figure 137 shows the whole article. The game is to throw the farthest, and there may be single contests or sides may be chosen. There is a notch in the thinner end, in which the forefinger is placed, the implement being sustained by the rest of the hand till thrown. Under favorable circumstances it may glide on snow or ice from 60 to 80 rods. Figure 140, *a* and *b*, shows the small end vertically and horizontally. Figure 139 is from the center, on which the maker placed a date. Figure 151 is a group of young Onondagas with their snow snakes. Western Indians sometimes throw unbent bows in the same way.

Mr Morgan described another winter game which the writer has not seen at Onondaga, but which old men vaguely recall there. It is called *da-ya-no-ia-yen-da-qua* by the Senecas, or the snow boat. This article was about 15 inches long and made of beech or other hard wood. The form was that of a canoe, pointed at both ends and slightly upturned at one. In the center was an elliptic excavation, and a small bow might be placed over this, with bells or rattles suspended. A white feather in the stern served as a flag and per-

haps aided in steering it. The game was a race down a hill ending in an open plain. Trenches were made in the snow and water was applied to form ice. The trenches were about a foot wide and equaled the players in number. Four clans were arrayed against the other four at the base of the hill, their champions taking their boats to the top. These were coated with ice and started down their tracks, which were from two to a dozen in number. Each player had two or three boats, a count being allowed for each till the score was made. Figure 34 shows a boat of this kind. *Morgan,* 1 : 294

The Onondagas use a bark sled on which a boy rides standing, as in figure 68. The bark is cut in a long triangle, a notch being made in each side of the narrow end, to which a bark rope is tied. This draws it up and backward, much like a toboggan but not curling over. The boy holds the rope in his hand, standing on the broad end of the bark, and thus slides down hill. Each strives to go farthest and swiftest.

Lacrosse is one of the finest of ball games, and was played by all Indians east of the Rocky mountains. Two poles were placed as gateways at each end of the ground, the one party trying to carry or drive the ball through its opponent's gate, and the other to prevent this. The ball was originally made from a knot of wood, but now one of leather is used. The bat is a bow of hickory, bent somewhat like a fishhook and partly equipped with a netting of sinews. The bend is cut so that it may readily slide under the ball and pick it from the ground. It is then borne on the network or thrown from it, as need requires. Figure 118 shows the bat, 64 inches long and 10 broad. When the two sides are ready, a player from each meet in the center of the field, placing one bat over the other, with the ball on it. At a signal it is thrown in the air, and the contest begins. It must not be touched with the hand, and, if it falls to the ground, the bat must slip under and raise it again. When a dozen are trying to do this, there are lively times. Its name is *ka-che-kwā-ah'*.

Another ball game has been described by the writer alone. It seems derived from base ball, having a pitcher and batter, bases and

field men, but it differs in many respects. As it certainly is not aboriginal, it will not be described here. It is an Onondaga game, and the writer has illustrated it with a diagram. *Beauchamp,* 8: 213

False Faces

The first mention of wooden masks near New York was among the Hurons of Canada. In a dance to drive away a pestilence, "all the dancers were counterfeits of hunchbacks, with wooden masks, the whole ridiculously made, and each a staff in hand; behold an excellent medicine. At the end of the dance, at the order of the sorcerer *Tsondacoüane'*, all the masks were hung at the top of a pole at the top of each cabin, with the straw men at the doors." *Relation,* 1637. The next night they hung "the wooden masks and straw men above each cabin." At another time they put "a sack on the head, pierced only at the eyes."

Masks seem to have been rare among the early Iroquois, but Lamberville mentions "a masquerade of people dressed like bears" at Onondaga in 1676. At another dance, on the same occasion, "the guests were covered with feathers from their heads to their feet, and were all masked;" but there is no hint of what the masks were like.

In 1687 Beschefer went with De Nonville in the Seneca invasion, and wrote to Villermont:

> I was mistaken when I told you that the Iroquois wore no masks. They make some very hideous ones with pieces of wood, which they carve according to their fancy. When our people burned the villages of the Tsonnontouans, a young man made every effort in his power to get one that an Outaouae had found in a cabin, but the latter would not part with it. It was a foot and a half long, and wide in proportion. Two pieces of a kettle, very neatly fitted to it and pierced with a small hole in the center, represented the eyes. *Relation,* 1687

These are the only allusions to wooden masks in New York in the 17th century, and from the tone of the last it may be inferred that those at Onondaga were not of wood. The Senecas had one town of Hurons, and these may have introduced wooden masks among them. At the New Year's feast of 1656 they are not men-

tioned, though now a leading feature of that great festival. John Bartram saw them at Onondaga in 1743. At night:

> We were entertained by a comical fellow, disguised in as odd a dress as *Indian* folly could invent; he had on a clumsy vizard of wood colour'd black, with a nose 4 or 5 inches long, a grining mouth set awry, furnish'd with long teeth, round the eyes circles of bright brass, surrounded by a larger circle of white paint, from his forehead hung long tresses of buffaloes hair, and from the catch part of his head ropes made of the plated husks of *Indian* corn; I cannot recollect the whole of his dress, but that it was equally uncouth; he carried in one hand a long staff, in the other a calabash with small stones in it for a rattle, and this he rubbed up and down his staff. . . In my whim I saw a vizard of this kind hang by the side of one of their cabins to another town. *Bartram,* p.43

It is a little remarkable that these two descriptions might be used for Iroquois wooden masks of today, and that probably every feature mentioned belonged to the first one used here. After the Revolution they were often mentioned, and certainly increased in number and importance. The wearers have now official duties, some of which formerly belonged to the chiefs. David Cusick said: "They have a certain time of worship: the false faces first commence the dances; they visit the houses to drive away sickness, etc." *Beauchamp,* p.30

To the fact that the early missionaries found no public use of masks here, and for a long time knew of none in New York made of wood, we may add that Bruyas records no Mohawk word meaning a mask, or referring to its use. We may therefore conclude that it came into New York late in the 17th century, and that the Senecas used it first of all. Most changes came through the symbolic doors of the Konosioni; civilized influences through the Mohawks, and savage through the Senecas. Of this there are many proofs. On this point the opinion of Mr William H. Dall may be cited:

> It will be observed that, while the association of the mask with a spiritual being, and an implied connection between the action of that being upon a third party with the wearing, by a devotee of the supposed spirit, of a mask symbolizing the latter, and, in general, the invocation of spirits for medical purposes, are features common

to wearers of masks among savage peoples everywhere, yet the details of the origin and symbolism of the Iroquois masks is quite different from anything reported from the coast of northwest America. Moreover, it appears to be certain that the use of masks among the people of the Mississippi basin and the Atlantic watershed was rare, and formed no prominent feature of their festivals or customs. *Dall,* 3: 145

Many accounts of the False Faces as a society have appeared, but Morgan's was the first and covered most points. There were early stories of bodiless flying heads, of whom the masks were representatives. These had wonderful powers, and on these were based that secret organization found now in every Iroquois village. Morgan said:

This society has a species of initiation and regular forms, ceremonies and dances. . . If any one dreamed he was a False Face, it was only necessary to signify his dream to the proper person, and give a feast, to be at once initiated; and so any one dreaming that he had ceased to be a False Face, had but to make known his dream and give a similar entertainment to effect his exodus. In no other way could a membership be acquired or surrendered. Upon all occasions on which the members appeared in character they wore false faces of the kind represented in the figure, the masks being diversified in color, style and configuration, but all agreeing in their equally hideous appearance. The members were all males save one, who was a female, and the Mistress of the Band. She was called *Ga-go-sā Ho-nun-nas-tase-ta,* or the keeper of the False Faces; and not only had charge of the regalia of the band, but was the only organ of communication with the members, for their names continued unknown. The prime motive in the establishment of this organization was to propitiate those demons called False Faces, and among other good results to arrest pestilence and disease. In course of time the band itself was believed to have a species of control over diseases. . . When any one was sick with a complaint within the range of their healing powers, and dreamed that he saw a False Face, this was interpreted to signify that through their instrumentality he was to be cured. Having informed the mistress of the band, and prepared the customary feast, the False Faces at once appeared, preceded by their female leader, and marching in Indian file. Each one wore a mask or false face, a tattered blanket over his shoulders, and carried a turtle-shell rattle in his hand. On entering the house of the invalid, they first stirred the ashes upon the hearth, and then sprinkled the patient over with hot ashes until his head and hair were covered; after which they performed some

manipulations over him in turn, and finally led him around with them in the false face dance (gā-go-sā), with which their ceremonies concluded. *Morgan,* 2 : 158

This relates to the Seneca False Faces. In Onondaga a mask is called *ka-kone'-sah,* or a face, the adjective not appearing. Mr De Cost Smith gives the harder sound, *ga-gu^{n}'-sa,* in his excellent article on this subject in the first volume of the *Journal of American Folk-Lore.* This is well illustrated, is fuller than anything yet written and is thoroughly reliable. After those whom they represent, the Onondaga False Faces are also called Hat-do'-ĭ, or Ho^{n}-do'-ı, usually the former, the latter being the plural. Mr Smith had fine opportunities for continuous observation and study at Onondaga, and made a good collection of masks there, one of which he gave to the writer.

At that place the False Faces appear on several occasions. Everywhere they have had a prominent part in the New Year's feast. In connection with that, but a little later, they visit all houses adhering to the old faith. The writer met them on this annual round, Jan. 29, 1896, and got a picture of part of the troop. There seemed more fun than religion in their proceedings as they went from house to house. The first one had a piazza, and on the floor of this they struck with their rattles, and occasionally on the door. Then they knelt down and beat again, while one entered the house. The door again opened, and all entered, crawling on their hands and knees and beating with their rattles. The leader had already danced around in the house, putting ashes on the heads of the inmates, crying "Hoh!" as he did so. Then the rest came in and danced around, taking up ashes in the double hand, putting them on the head by blowing, with a puff. Then they took up the inmates in chairs, a man on each side, and danced around with them. Pounded parched corn was given them to eat in the house, and some food was placed in their basket. Then they went to another house.

This probably differs much from the earlier and more serious visitation, but this was the Onondaga custom in 1896.

There are some things about the False Faces which have never been published. The large wooden masks are well known, but in

Onondaga houses small ones are often seen. These are for children. When a child is sick, the aid of the False Faces may be asked; and, if it recovers, a small wooden mask is made, which it keeps, and which is to aid it in future trials. This is called *ho-yah-dah-nuh'-na,* an assistant. Small stone masks were sometimes used as tokens of membership. At the more important dances from two to four wear husk masks, called *kah-je'-sah.* Their duty is that of door-keepers or policemen. They are to suffer none to go out during the dance, but a plug of tobacco usually opens the door.

The False Faces throw ashes. Another medicine society is composed mostly of women. These sprinkle water over the sick with corn husks, and are called *Wat-nă̆-ko-ah'-gue,* Throwing water at each other. There is still another, the members of which take water in the mouth and spurt it over the sick in the ancient way.

The masks themselves are supposed to have each its own spirit, and these must have due attention. If long neglected, they make trouble. They should attend dances when possible; at least be taken out and talked to from time to time. Tobacco pleases all spirits, and a little bag of this tied to a mask keeps it good-natured. Such a bag was tied to one owned by the writer, and it was a very quiet mask, though not canny in its looks. This tobacco should be of the native species, Nicotiana rustica, having a yellow flower. The writer has grown this.

In a second article on Onondaga demonology Mr Smith added some particulars, and among them the following, which owners of masks should heed: "When masks are not in use, they are laid away, out of sight, face downward. Leaving them with the face up, like a corpse, thus intimating that they are dead, would displease the Ho^{n}-do'-ĭ, while, if hung up with the face out, they will be noisy at night and cause trouble." *Smith,* 2: 280

David Boyle found that there were two False Face societies among the Six Nations of Canada, one being well known and the other secret. He calls the society *Ah-k'on-wa-rah,* and gives rules for admission quite different from those found in New York. This depends on proper qualifications, and not on a dream. According to him the initiation is very simple. *Boyle,* 1898, p.158

In both the papers mentioned are some of the curious stories connected with these masks and their supposed originals, such as trials of strength, the twisted mouth, the husk masks and other like things. These have nothing to do with their use and will be omitted here, for they open up the whole subject of the extravagant or beautiful tales of the Iroquois. The writer has had from the Onondagas the same stories which Boyle and Smith record.

Neither of the writers mentioned met with masks which he had any reason to think 100 years old. On the contrary, Mrs Harriet Maxwell Converse found some to which she ascribed a great age, apparently from their rude character and worn appearance. Due weight should be given to all such evidence, but it is uncertain because affected by the skill of the maker and the care of the owner. Traditions of age are also of little value, though not to be disregarded. In Indian history there is no more uncertain element than time. On the whole, it seems probable that wooden masks were first used in New York in the last half of the 17th century, and apparently not then in public ceremonies. They certainly were not used in the New Year's feast in 1656 at Onondaga.

As might be expected, the Senecas attach to masks many meanings which are not found elsewhere. Mrs Converse found among them some of which the Onondagas know little or nothing. This seems the case in Canada. Any society of False Faces would partially develop its own ritual and symbols, and, in studying these, Mrs Converse had the advantage of adoption by the Senecas and membership in a medicine society. In procuring the valuable collection of masks which she made for the State Museum, possession of the article was subordinated to the question of its use. What did it mean? How and when was it used?

The answers will not be uniform, for ceremonies and meanings vary. In a New York newspaper of 1899, Mrs Converse describes corn husk, night, laughing, wind, winter and summer, war and scalp, good and evil, bird, fish and game, medicine or doctor, exorciser, clan, small and large maternity, and women masks, and adds: "These are but a few of the varieties of the Iroquois masks, but they serve as illustrations of the service." The names of the 10 masks

illustrating her paper are the cornhusk or doorkeeper's, Canadian beggar, exorciser or witch, laughing, dancing buffalo, maternity with small mask, mystery, wolf, guardian of the harvest, and big breath or wind masks. Her accounts of these are of great poetic interest at least. She adds:

Among the Iroquois of today there are several mask carvers, but these fail to reproduce the singular features of the ancient mask. Their delineations are grotesque only, and the old art of mask carving has passed away with the passing Iroquois. There are but few of the old masks left, and the State Museum has secured the largest numbers of these old relics of the Iroquois carvings. *Converse*

Wooden masks are made of basswood, often termed whitewood by early writers. This cuts easily in the spring, and one Onondaga does a thriving business in making them. There are several leading types, and, to illustrate one tradition, some have the mouth awry. Modern features are moustaches and projections on the forehead, mouth and nose.

Cornhusk masks are braided very smoothly as far as the face goes, and around this some coarse and loose ends project to represent hair. These are worn by doorkeepers.

Mr Boyle said that the common False Face society is not a secret one in Canada, nor is there much reason for calling it such in New York. Certainly the members are well known. Mr Boyle adds: "The fiction is maintained of having two women to act as mediums of communication between the society and outsiders, but these women are only the cooks of the feast."

While those who wear the corn husk masks are only doorkeepers in New York, in Canada they form a society of 30 persons, the invisible corn husk people numbering the same. The society differs from that of the False Faces, meeting thrice a year and using cold water instead of ashes. The number is always maintained. But one person at a time is able to see the original corn husk people, and this power is confined to one family. The society is called Ra-tsisa, and the leader's title is Sha-go-na-den-ha-weh. *Boyle*, 1898, p.163

Farther details of use and meaning may be omitted for the present, as this paper deals more with the material than the psychic features

of these grotesque objects. Some reference to the latter seemed proper, but this will now give place to a brief account of the general character of these masks, and the description of a few examples. In general, they have not been highly valued. Mr De Cost Smith got a large collection at Onondaga at a small cost and with little effort. The State Museum has over 100 examples, and they are found in other collections. They rarely lack the metallic circles for eyes and have two or three strings to attach them to the head. Long horsehair is quite commonly used, and till quite recently they were usually painted with Indian red. In a few instances the tongue protrudes, and in many there is an attempt to represent teeth. The very broad lips and those puckered and pointed seem a recent idea. With rare exceptions the character is grotesque. Two Onondaga masks figured by Mr Smith had projecting lips, and their owners thought they were respectively made about 1860 and 1870. Other forms were supposed to be a century old.

Figures are given of a few masks, illustrating some of the principal types. Two of these are made of corn husks, and these are worn by the doorkeepers. Figure 145 is the largest of these and is woven so that the loose ends of husks represent hair. Figure 146 is a little smaller and has no loose ends. Both are very ingeniously woven.

Figure 141 is of wood, as are the three following. Its dimensions are 6½ by 11½ inches, and it has a curiously formed projecting mouth, much resembling some Japanese masks. Its modern character will be seen at a glance. Figure 142 is one of the so called maternity masks, having a very small mask attached. The expanding lips form a common feature. The dimensions are 6 by 10 inches. Figure 143 shows one of the more frequent forms, the size being 5½ by 9 inches. Figure 144 has the mouth awry, in conformity with one of the legends. This is 6 by 10 inches. Three of these are adorned with horsehair, but this feature is often lacking.

Figure 147 is from a small photograph of part of a group on the annual round at Onondaga, Jan. 29, 1896. They were on a slow run in the snow. Figure 148 is from Mr De Cost Smith's sketch of

a False Face in dancing costume, made at the Onondaga council house, Jan. 14, 1888. He holds the customary staff and turtle-shell rattle used in dancing. In dressing for the occasion nothing comes amiss which can make the costume fantastic or hideous. Tin pans or other vessels are sometimes stuffed under the clothing, as may be seen in some of these figures, and like distortions of the figure date back to early days. The dances and ceremonies form another subject.

Miscellaneous

As a rule, a New York Indian troubled himself little about bridges. A good swimmer, he easily crossed any ordinary stream, and usually had little care about wetting his clothes. When he wished to spare these, a tree fallen across the stream often gave him safe passage. The women, arrayed in their finery, wanted something better, and bridges were built. Cammerhoff's journal of June 29, 1750, speaks of one near Lake Onnachee or Canandaigua:

> We continued on our way to Lake Onnachee, passing along its shores to its outlet, where it is crossed by an Indian bridge. This was the first of this kind that we had seen. It was constructed on stakes, driven into the ground and bound together by bark, and on these small trees and poles had been laid, over which we were obliged to walk, a very dangerous proceeding. *Cammerhoff,* mss

There was also a bridge at Onondaga in 1752, a graded way leading from the fort to the water a few years later. It was much out of repair, and Zeisberger said:

> Otschinachiatha begged us to mend the bridge across the creek; most of them had their plantations over there, and when the women carried their corn across, they were always in danger of falling into the water; we promised to do it . . . Saturday, Sept. 22nd. We repaired the bridge for the Indians who called out many a "Niarwo." The whole town rejoiced to have a good bridge, particularly the old people. *Zeisberger,* mss

Their rude agriculture may often have required protection, but of this we know but little. Loskiel tells us that "their plantations are surrounded with high fences, chiefly to keep off the horses, which feed in the woods without a keeper;" and the Moravian missionaries found it inconvenient to take horses among the Iroquois,

because they damaged defenseless fields. When John Bartram passed the small Onondaga village of *Tu-e-yah-das'-soo,* in 1743, he saw appletrees full of fruit. "The *Indians* had set long bushes all round the trees at a little distance, I suppose to keep the small children from stealing the fruit before they were ripe."

Roger Williams is singular in what he says of the depredations of birds: "They put up little watch-houses in the middle of their fields, in which they, or their biggest children lodge, and earely in the morning prevent the Birds." *Williams,* ch.15

The same author said: "The *Indian* Women to this day (notwithstanding our Howes) doe use their naturall Howes of shells and Wood." Of these he mentioned "A breaking up How," and "A weeding or broad How," with their Indian names. Bruyas gave *onarate* as the Mohawk word for wooden hoe. It may have been of one piece.

A good deal of maize was shelled, charred, and placed in pits, lined with bark, and this was a general custom. *Asaton* was the Mohawk word for making a cache, and open ones are still frequent but reduced in size. Occasionally one is found filled with grain, and figure 105 shows some of this charred corn, perhaps 400 years old.

Bruyas alone took notice of one use of fuel in New York, which yet may have been frequent in suitable places. *Gaiengouaroutanni* meant to give a signal by the smoke of a fire made on purpose for this. He also mentioned a shuttle, but did not say whether it was of wood or bone. Something of this kind was also used in a child's game.

He also recorded *gaionwe* as the Mohawk word for "a willow hurdle for drying anything," without further description. Four crotched sticks were placed in the ground, forming a rectangle and connected by horizontal rods. On these cross sticks were thickly laid, and on these fish, or other things requiring to be smoked or dried, were placed. For smoking a slow fire was kept up underneath. This was the custom in Canada and the eastern United States, and huckleberries were dried in a similar way.

Picture writing has been mentioned, and a rude map drawing was in use. Champlain spoke of this in 1605, for the Indians of New England drew quite well, with charcoal, the capes, bays and mouths of rivers along the Atlantic coast. Lafitau said that the northeastern Indians drew rude but accurate maps on bark or on the sand. The former were kept in the public treasury for times of need.

In 1759 Sir William Johnson gave General Gage a draft of the St Lawrence river made by Red Head, an Onondaga. Other instances might be cited of a very primitive kind, but the most curious was that seen by Van Curler at Oneida, in 1634:

We asked them all sorts of questions about their castles and their names, and how far they were away from each other. They showed us with stones and maize cakes, and Jeronimus then made a chart of it. And we counted all in miles how far each village was away from the next. *Wilson,* p.94

Champlain said of an Ottawa chief in 1615, "I conversed with him about what belonged to his country, which he drew for me with a coal on a bark of a tree."

Many accounts might be quoted of the sweating-house and of the lodge used by conjurers. That of the latter by John Bartram, when passing through Tioga county in 1743, will suffice:

They cut a parcel of poles, which they stick in the ground in a circle, about the bigness of hop poles, the circle about five foot diameter, and then bring them together at the top, and tie them in form of an oven, where the conjurer placeth himself; then his assistants cover the cage over close with blankets, and to make it still more suffocating, hot stones are rolled in. . . There is usually a stake drove into the ground about four foot high and pointed. . . I have seen many of these places in my travels. They differ from their sweating coops, in that they are often far from water, and have a stake by the cage, yet both have a heap of red hot stones put in. *Bartram,* p.32

At the same time this author described the cooking of eels:

Their way of roasting eels is thus; they cut a stick about three foot long, and as thick as one's thumb, they split it about a foot down, and when the eel is gutted, they coil it between the two sides of the stick, and bind the top close, which keeps the eel flat, and stick one end in the ground before a good fire. *Bartram,* p.33

One universal Indian remedy for ill health was the sweating-house, already mentioned. Another was vomiting, and songs, dances and charms were largely employed, but they had many good vegetable remedies. The fruits of trees will not be noticed here, nor the use of herbaceous plants, but some reference to the use of wood and bark may not be out of place. Loskiel and Kalm have described most of these.

The first mention of one of these remedies was by Cartier, when spending the winter of 1535–36 at Quebec. His crew were smitten by the scurvy, a disease to which the Indians there were also subject. One of these told him of a remedy, and two women brought him several branches of a very large tree. He was "to boil the bark and the leaves; to drink of the liquor every other day; and to put the dregs on the legs of the sick." This was effectual, and Cartier was extravagant in its praise.

This tree the Indians called *haneda* or *ameda.* Hakluyt thought it the sassafras, and Schoolcraft the box elder. Oddly enough Champlain called it an herb. Belknap properly said it was an evergreen, having leaves in the winter, adding:

I am inclined to think that it was the spruce pine (Pinus canadensis), which is used in the same manner by the Indians, and such as have learned of them. Spruce beer is well known to be a powerful anti-scorbutic; and the bark of this and the white pine serves as a cataplasm for wounds and sores. *Belknap,* p.47

Pinus canadensis of Linnaeus is the hemlock spruce, and Morgan shared in this opinion, which seems correct for another reason. The Onondaga name for this tree is *o-nĕ-tah,* the common Iroquois term, and it was the Iroquois language which Cartier heard most on the St Lawrence, the names closely corresponding.

Loskiel described several vegetable remedies, and among them some obtained from trees. A decoction of the buds or bark of the white ash was taken to cure a rattlesnake bite:

A decoction of the roots and bark of the thorny ash (Aralia spinosa) is used as a purifier of the blood. The Toothach-tree (Zanthoxylum clava Herculis) resembles the ash, and is thus called, because the Indians use its wood as a remedy against tooth-ach.

Some thought the fruit of the tulip tree and the bark of its roots a cure for fever and ague. Many considered the flowering dogwood equal to Peruvian bark. Some made a medicinal draught from wild laurel wood. Sassafras was in high esteem, both bark and roots being used. "The flowers serve for tea, and the Indians also use the berries as a medicine." A decoction of the wood or buds of the common elder was also "an excellent remedy in agues, and the Indians use it likewise for inflammations."

The root of the sassafras has been largely used for its aromatic oil. The leaves are variable, "oval and entire, or mitten-shaped, or 3-lobed to about the middle and often as wide as long." It was thus described by the French at Onondaga in 1657:

> The most common plant and the most marvellous of these countries, is that which we call the universal plant, because its leaves bruised close up in a short time all kinds of wounds; these leaves of the size of the hand have the figure of the lily painted on armor, and its roots have the odor of the laurel tree. *Relation*, 1657

Conclusion

It is every way probable that the aborigines had many useful or ornamental articles of wood or of vegetable materials of which we have little idea. Some were laid aside when the more attractive ornaments of the white man met the eye. Nearly all have perished, and many were never mentioned by early observers. A knowledge that some existed has been preserved by mere words in early vocabularies, but there is little reason to doubt that some things known to us in stone and bone had their counterparts in wood. Who has seen in New York a wooden bead, or hoe, or shield? Yet all were in use 300 years ago. That many other common things perished with them, there is no reason to doubt. No trace remains of the grotesque house carvings of the Iroquois, and few of their ingenious appliances in everyday life. The skill shown in some gives us a hint of how skillfully every forest need was met in the abundant supplies of a broad forest land.

EXPLANATIONS OF PLATES

Plate 1

1 Horn rattle. A recent form used at the Onondaga reservation
2 Snowshoe used by the Onondagas and representing the common form
3 Bow as still made by the Onondagas and probably retaining the early character
4 *a*=blunt arrow, still used by all the Iroquois; *b*, *d*=common arrows, but rarer than the preceding; *c*=arrow tipped with horn, now a rare form, but frequent in early days
5 Fire drill with the bow. The usual primitive implement among the Iroquois for making fire
6 Arrow with two feathers, as used by the Onondagas
7 Arrow with one feather, among the same people
8 Feather prepared for binding on the shaft

Plate 1

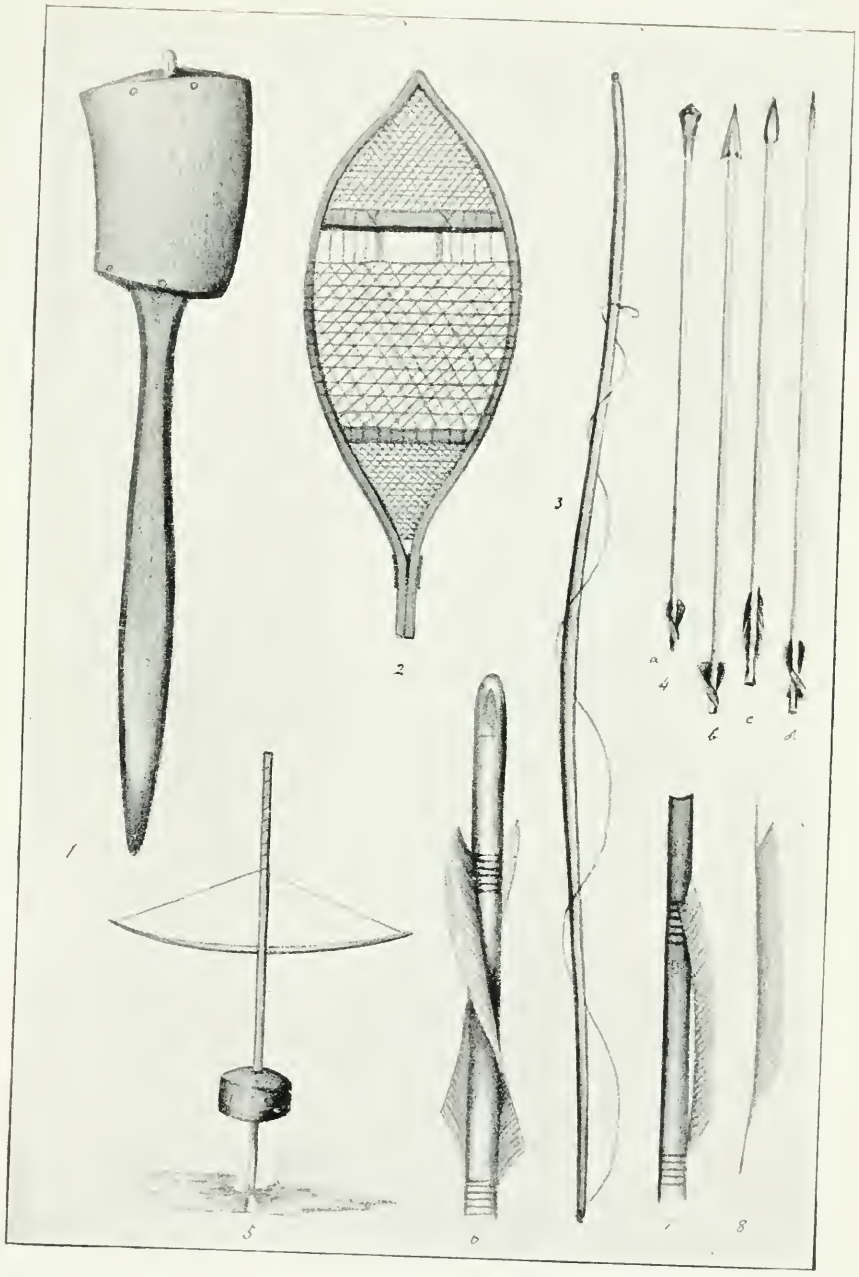


Plate 2

9 *a*=Bartram's plan of the Onondaga council house, made at his visit there in 1743, and showing the chambers and passage between; *b*=elevation of the same, showing the roof and upper chamber

10 Elevation of triple palisade with parapet, from early descriptions and recent explorations

11 Inner view of this palisade, showing the alternate posts

12 Elevation of double palisade with logs at the base, as described by Van der Donck

13 Simple triple palisade, before adding breastworks or parapets

Plate 2

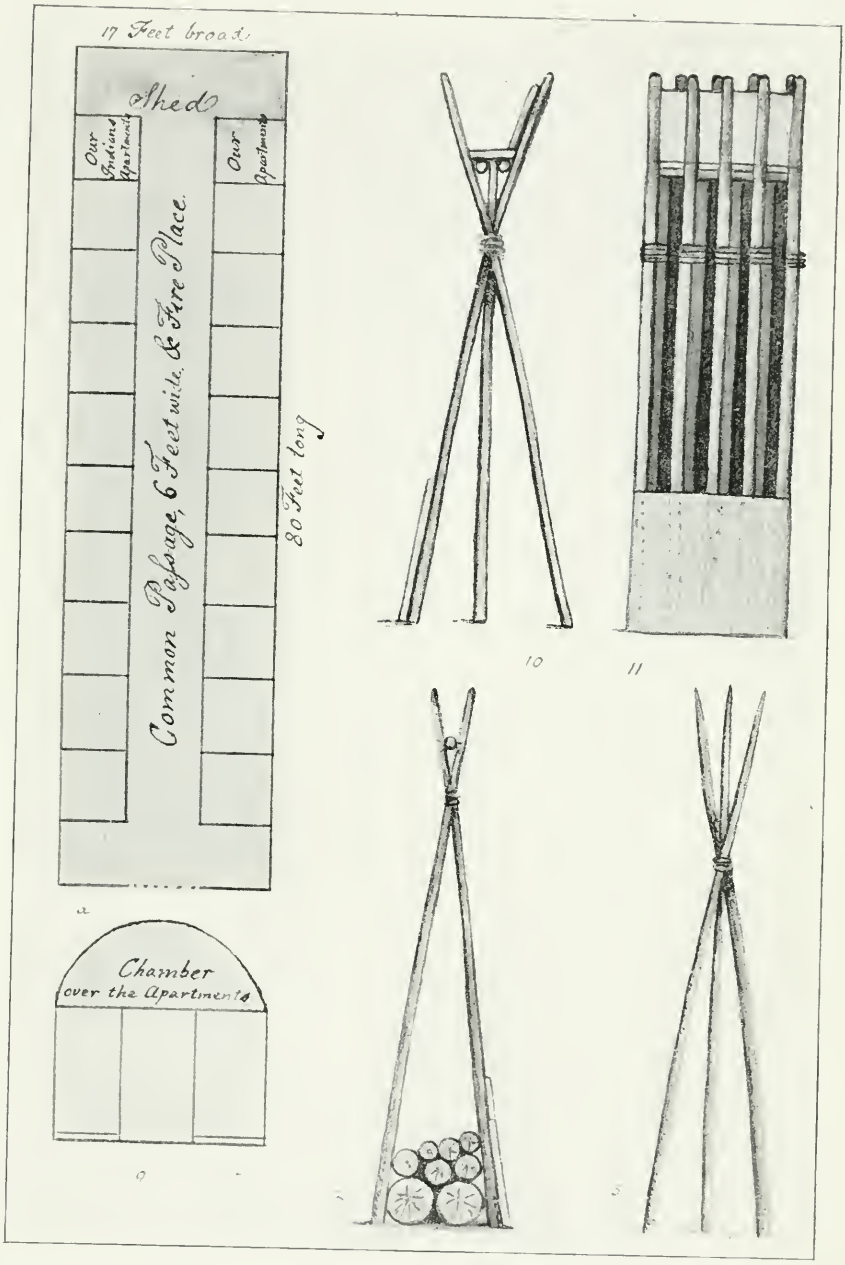
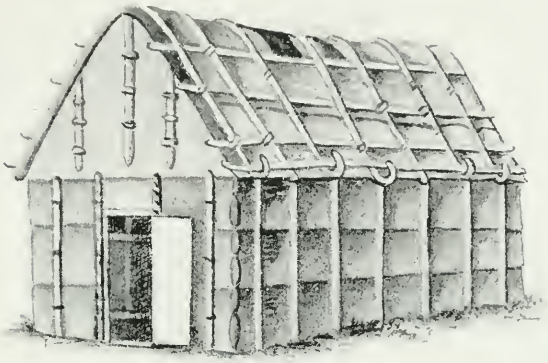

17 Feet broad.
Shed
Our Indian Apartment
Our Apartment
Common Passage, 6 Feet wide, & Fire Place.
80 Feet long
a
Chamber over the Apartments
9
10
11

Plate 3

14 Bark house as shown by Morgan, with inner and outer frame
15 Interior of the same, showing the arrangement of upper and lower berths
16 Long house from Morgan, having an angular instead of the usual rounded roof

Plate 3



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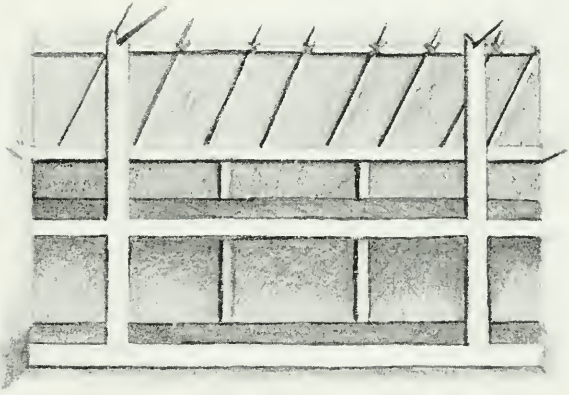

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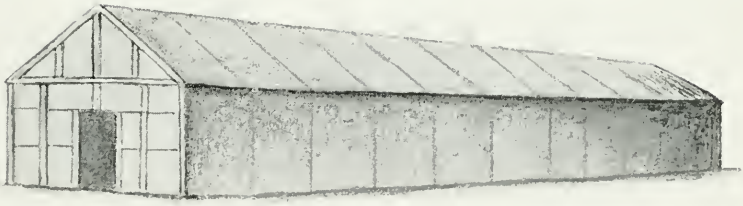


16

Plate 4

17 Fort and houses from Van der Donck. A circular stockade ascribed to the Minisinks

18 Houses from Colonel Romer's map of 1700, embracing three forms

19 Wigwam from petition of Schoharie Indians, showing chimney hole and doors at the side

20 Mahican fort from Van der Donck. This is angular and the houses have rounded roofs

Plate 4

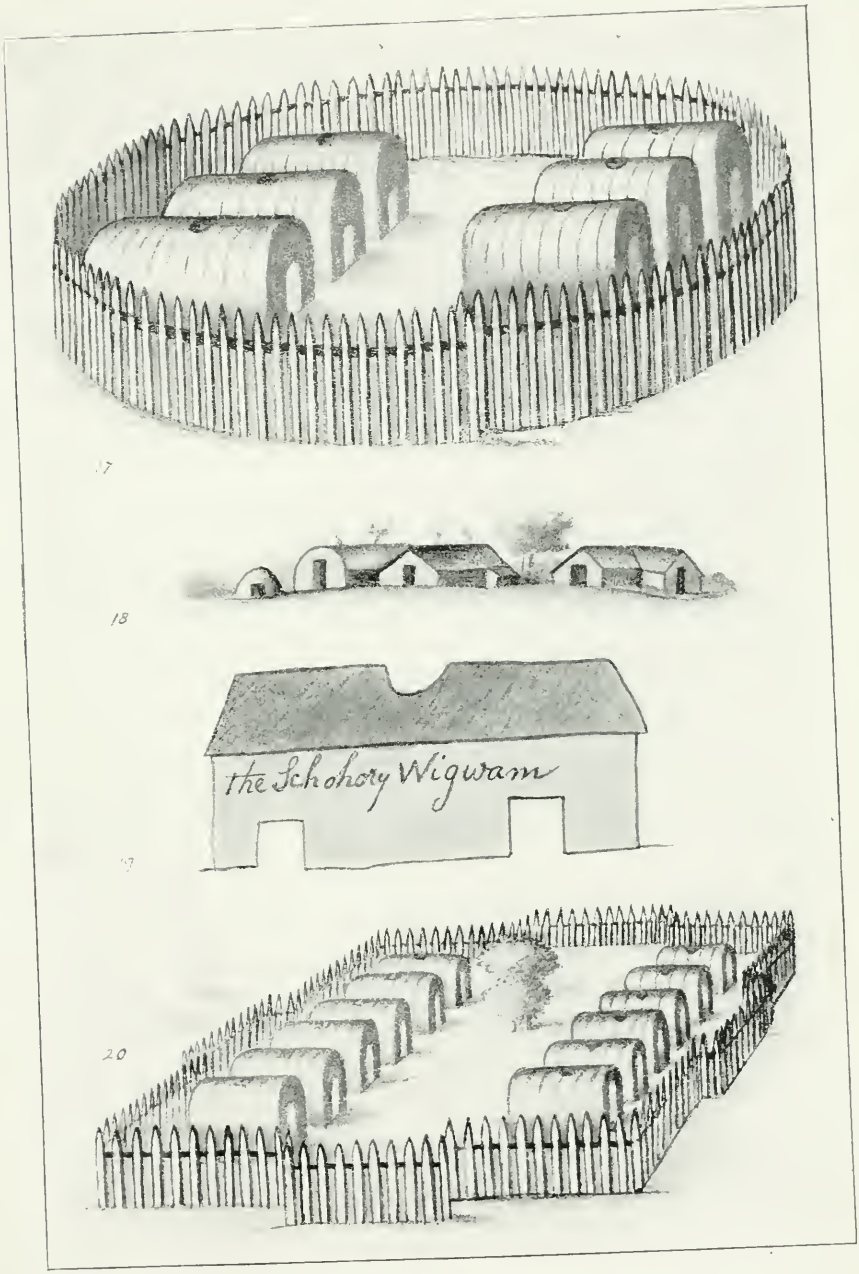


Plate 5

21 Plan of one of Sir William Johnson's Indian forts, built in 1756, and typical of most others of that period. The two blockhouses flanked the walls

22 Paddle from Champlain. This has an unusually angular and pointed blade

23 Elevation of early Iroquois bark house. *aa*=side posts, of which there are rows from end to end; *b*=junction of arch for the roof; *cc*=inside posts; *dd*=first elevated floor or bench; *ee*=second shelf; *f*=loft. To the outer frame large pieces of bark were stitched

Plate 5

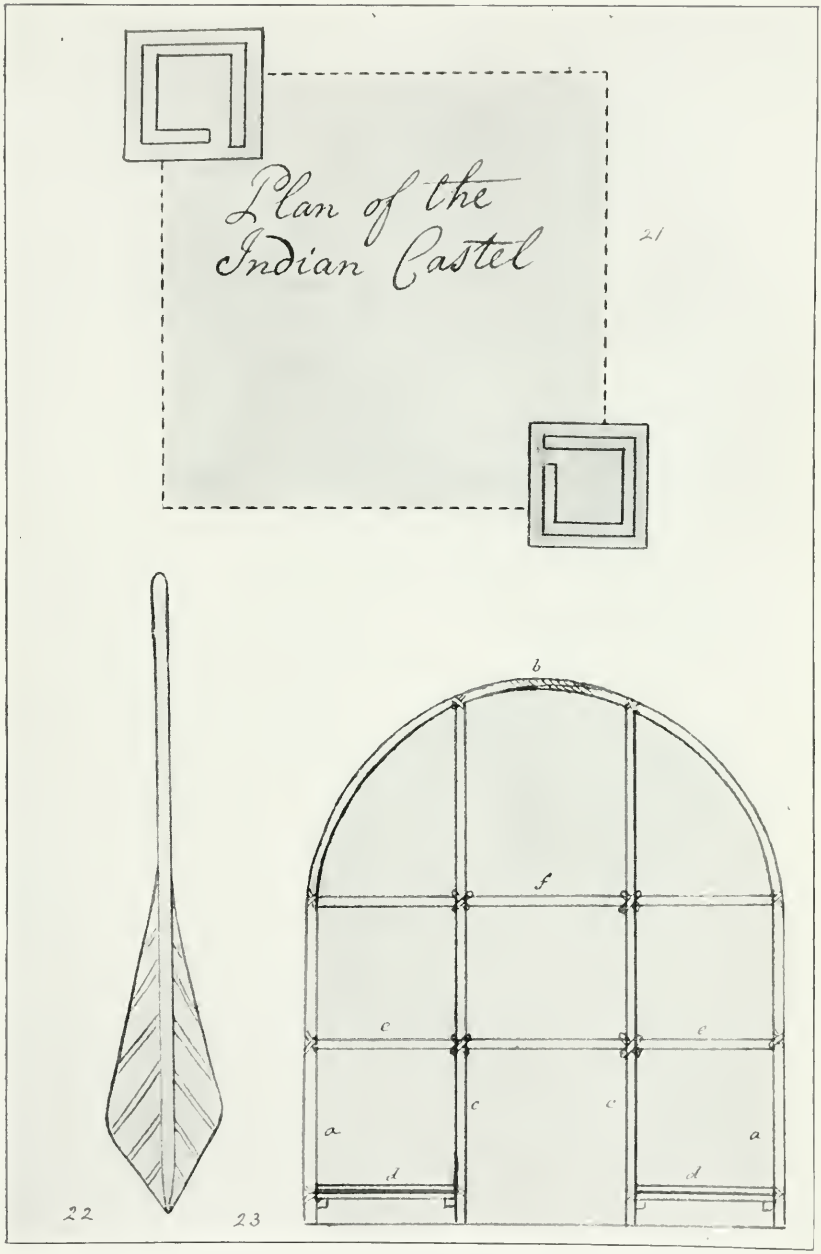


Plate 6

24 Making dugout canoe, from De Bry, showing the use of fire and stone implements

25 Frame of circular lodge of a common eastern Algonquin form, but not pointed like the western tepees

26 Circular hut from Champlain, such as were common in Canada in his day

27 Early picture of New York dugout canoe of very unusual form. The projections may have served in carrying it overland.

Plate 6

Plate 7

28 Wooden war club, still used in dances by the New York Iroquois
29 Modern war club of a simpler form
30 Head of blunt wooden arrow, being the kind most common on all New York Indian reservations and probably a very early form
31 Modern dart used on these reservations, but like those made by white children
32 Fragment of rush mat, taken from a Cayuga grave

Plate 7

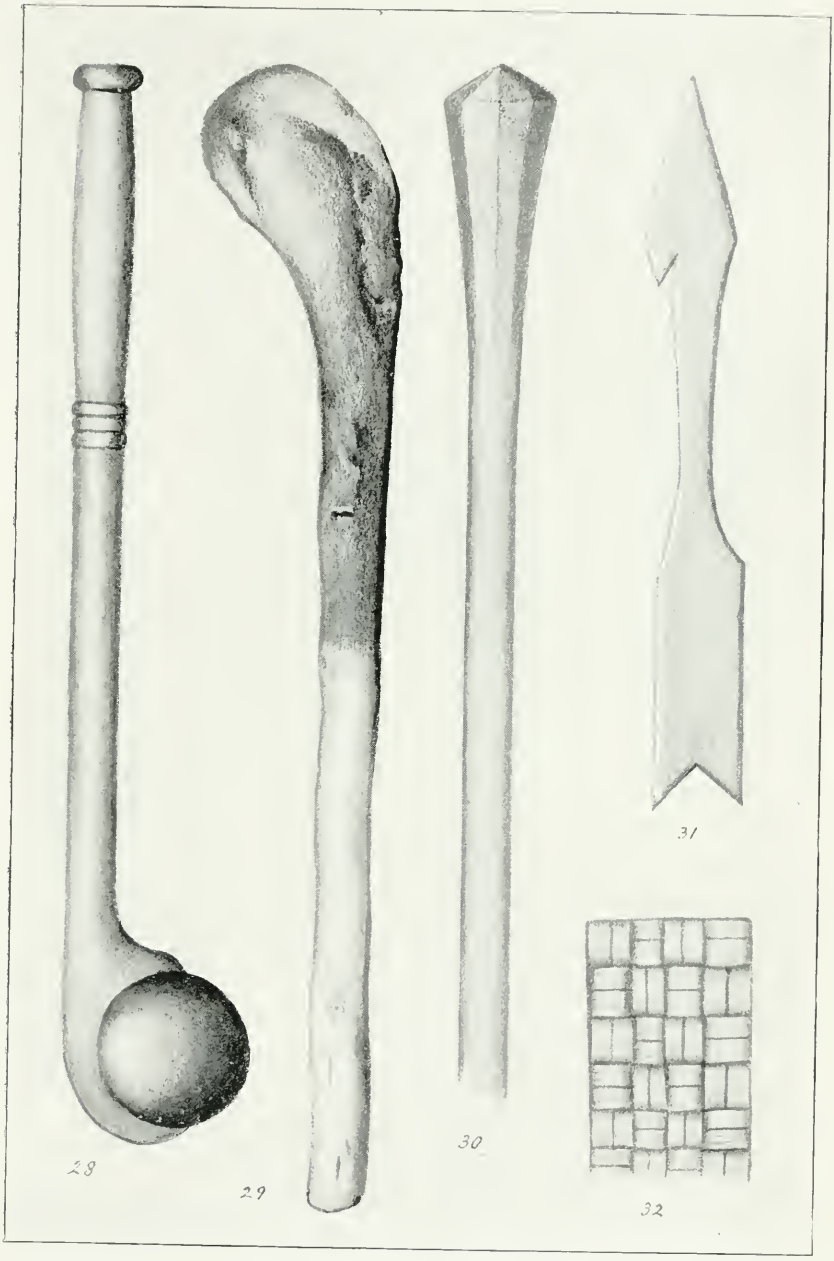


Plate 8

33 Bark trough, formerly used in collecting maple sap and often made by the Indians

34 Snow boat from Morgan's figure, and used in a winter game by the Senecas

35 Corn sieve, also from a figure by Morgan. This is not a common article

36 Bark scoop. This convenient article has now disappeared before modern substitutes.

37 Antique charred wood from a village site in Jefferson county. A rare thing to find in this form

38 Antique charred wood from Jefferson county

39 Javelin. This slender rod is used in a game

40 Hoop. This goes with the last, the javelin being thrown through the hoop.

Plate 8

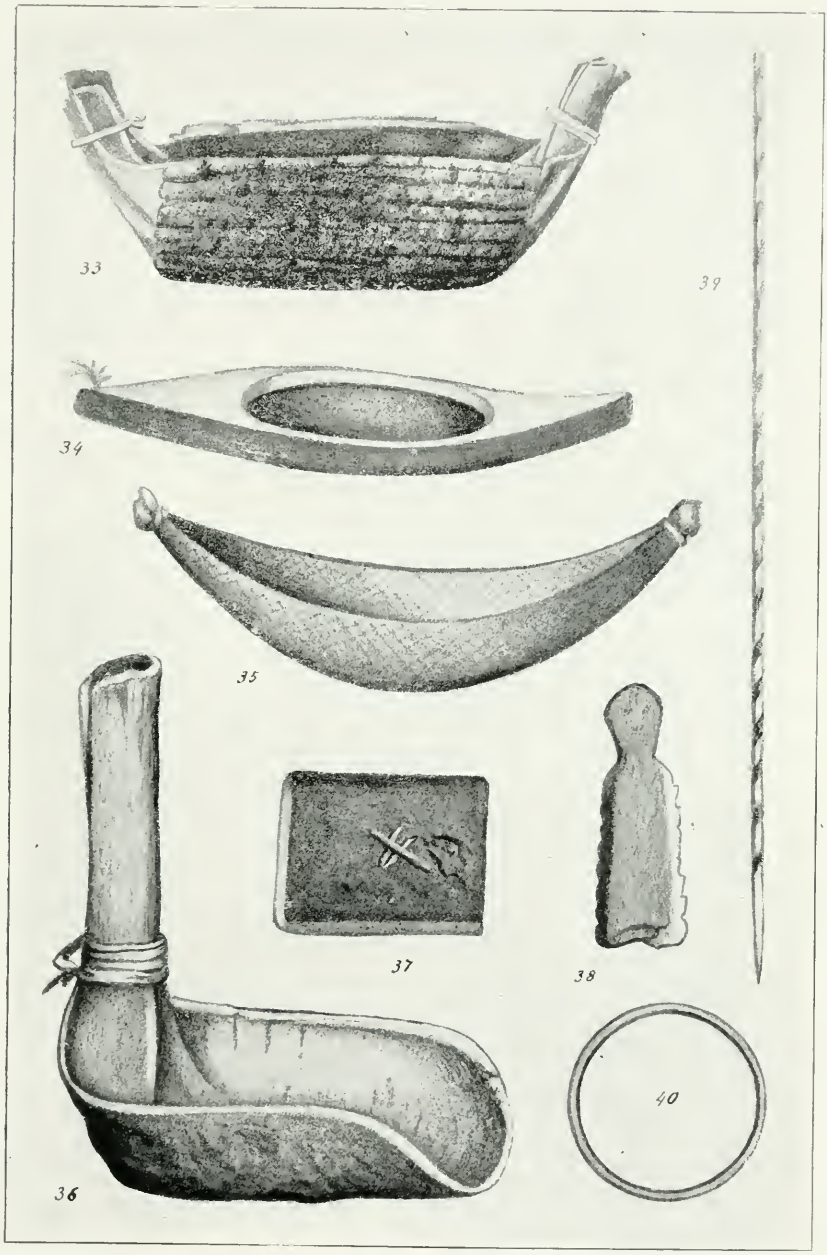


Plate 9

41 Cradle board, an Onondaga example, with strap attached for carrying or suspension
42 First stage of splint broom
43 Second stage of this, preparatory to turning the outside splints
44 Third stage, showing the broom when finished
45 Sieve made in basket form, and still used in sifting corn meal
46 Bark tray. A strong and well made article, useful in many ways
47 Arrow with stone point, as prepared by an Onondaga Indian

Plate 9

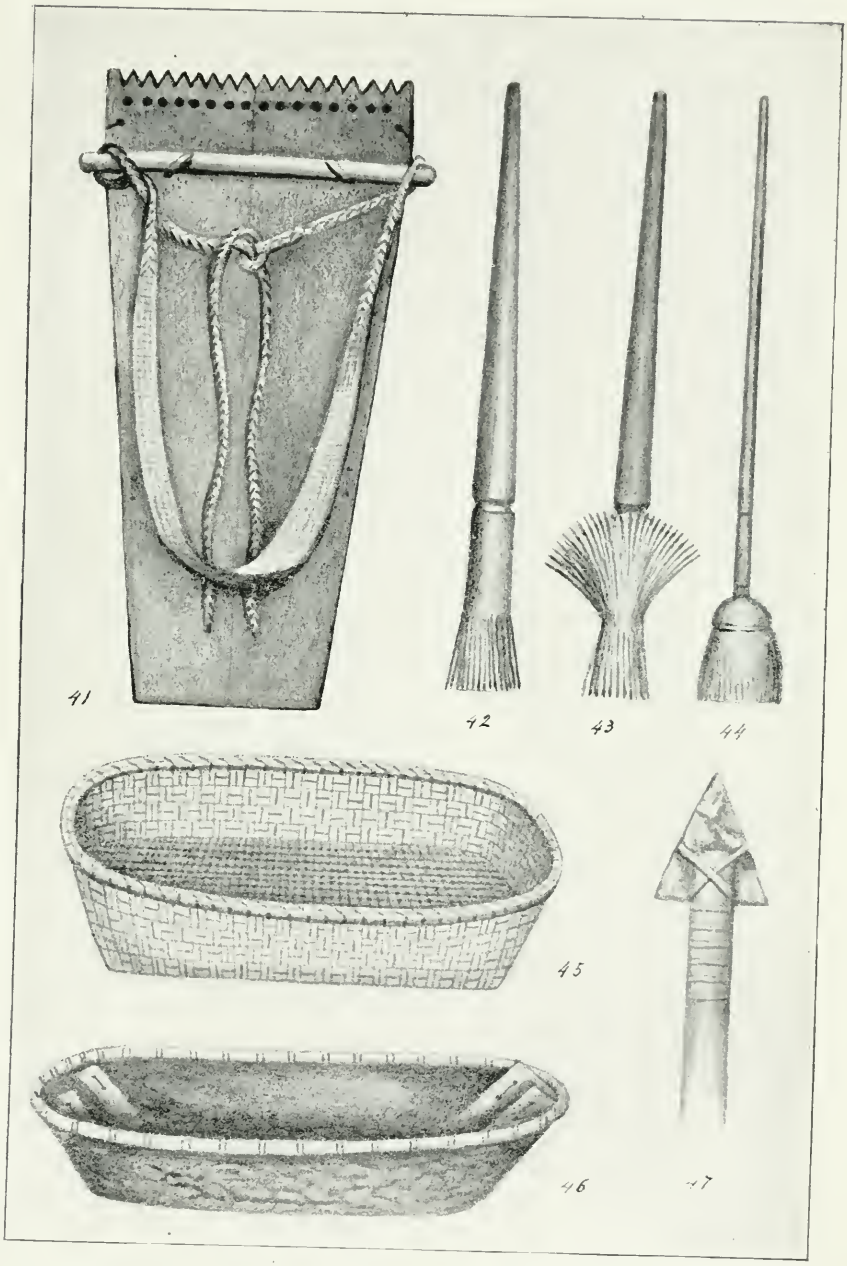


Plate 10

48 Salt cellar of modern form and rare
49 Braided bark as kept prepared for use
50 Bark fiber taken from the inner bark of the elm
51 Bark rope made of the same material. This is but little used now
52 Indian flute, formerly played by a lover to engage the attention of an Indian girl
53 *a*=small arrow with down, used in the blowgun; *b*=arrow with flannel, used in the same
54 Blowgun from Onondaga. A long wooden tube seldom seen now. The small arrows were shot from this
55 A curious form of club from an early French drawing. There is no description of this
56 Pestles and mortar from Onondaga. These early articles are largely used yet

Plate 10

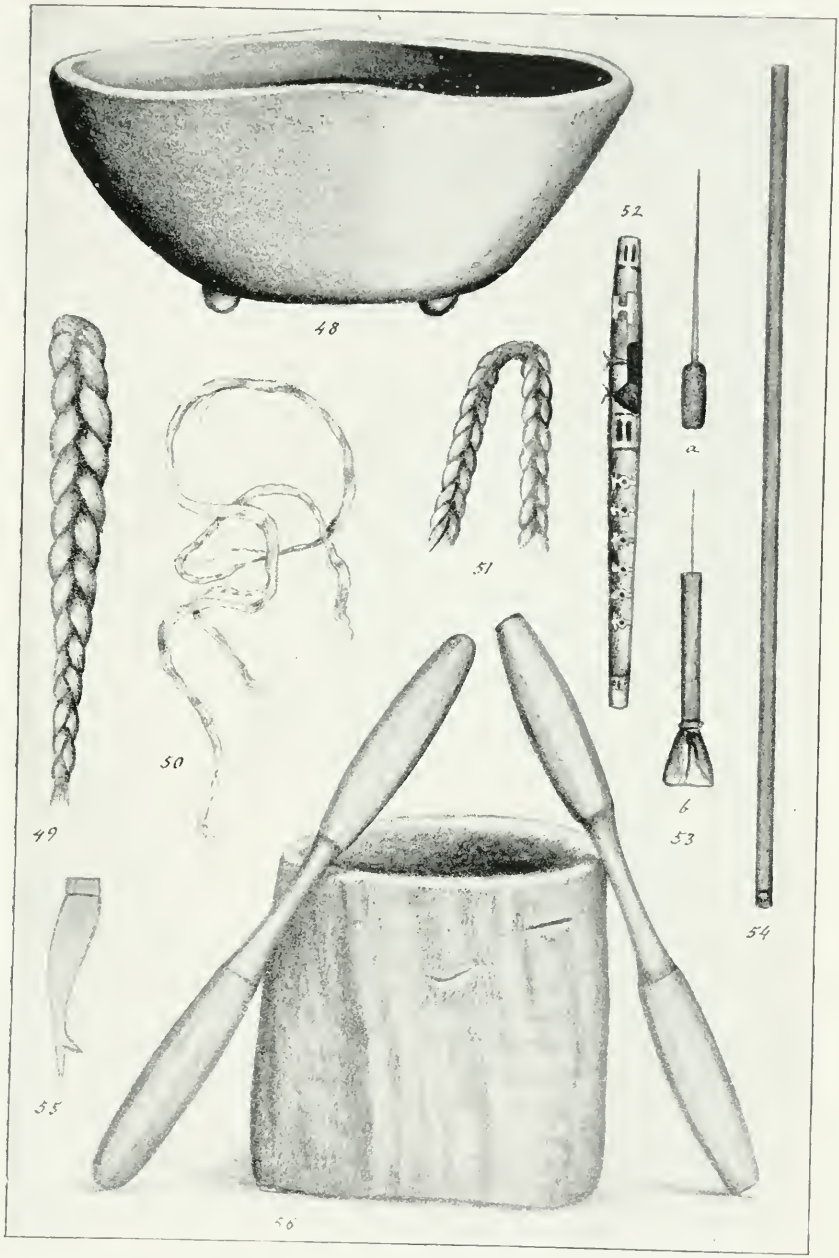
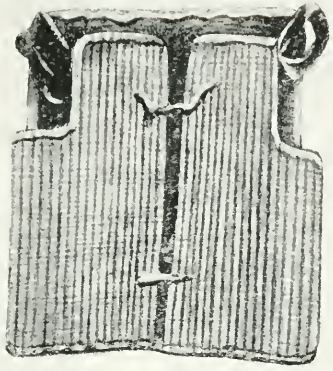


Plate 11

57 Coat of mail from a western source, but illustrating early eastern use
58 Helmet as it appears on antique pipes
59 Warrior in armor from Champlain. At that time the New York Indians fought much in the open field
60 Wooden ladle of large size and uncommon form

Plate 11



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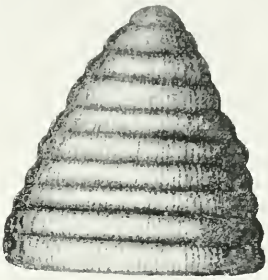

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Plate 12

The first four figures are from an early French source, illustrating Indian picture writing.

61 Hunter returning home. Figure 81, plate 14, belongs to this
62 Figures of the slain, who are reversed and without heads
63 Posts for prisoners, by which they were securely confined at night
64 Direction stick, arranged to convey a message to some one following
65 Circular shield from a figure by Champlain
66 Angular shield from Champlain's figure. This was used by the New York Iroquois
67 Basket of Iroquois manufacture
68 Bark sled used by Onondagas

Plate 12

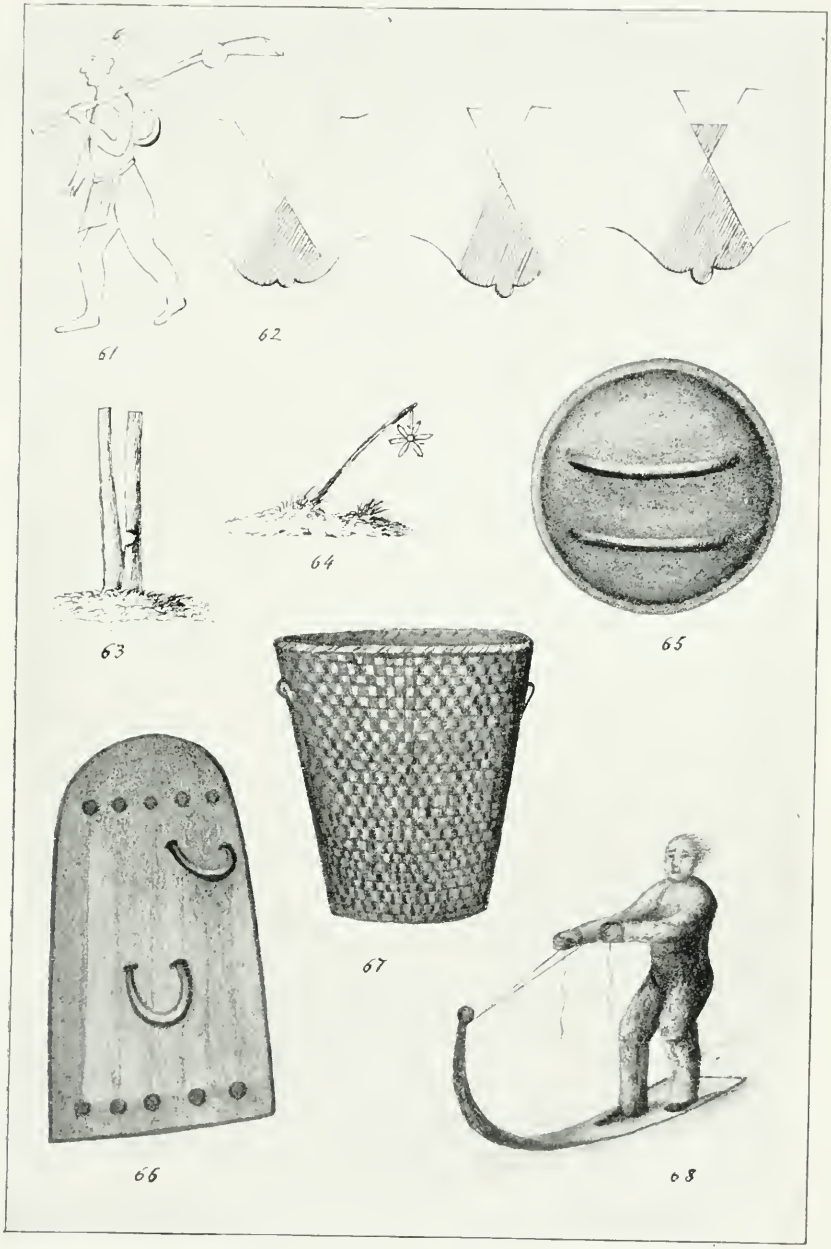


Plate 13

The figures on this and the next two plates are from a series prepared by a Frenchman to illustrate early Iroquois life.

69 Turtle totem, as painted on houses or elsewhere

70 Wolf totem

71 Bear totem. These three are the principal Iroquois clans. The later ones follow

72 Beaver totem

73 Deer totem. This alone has no weapon

74 Eagle clan, sometimes called the Hawk

75 Little Plover, now known as the Snipe

76 Great Plover, usually called the Heron now

77 Potato clan of the Senecas. This clan does not now exist

Plate 13

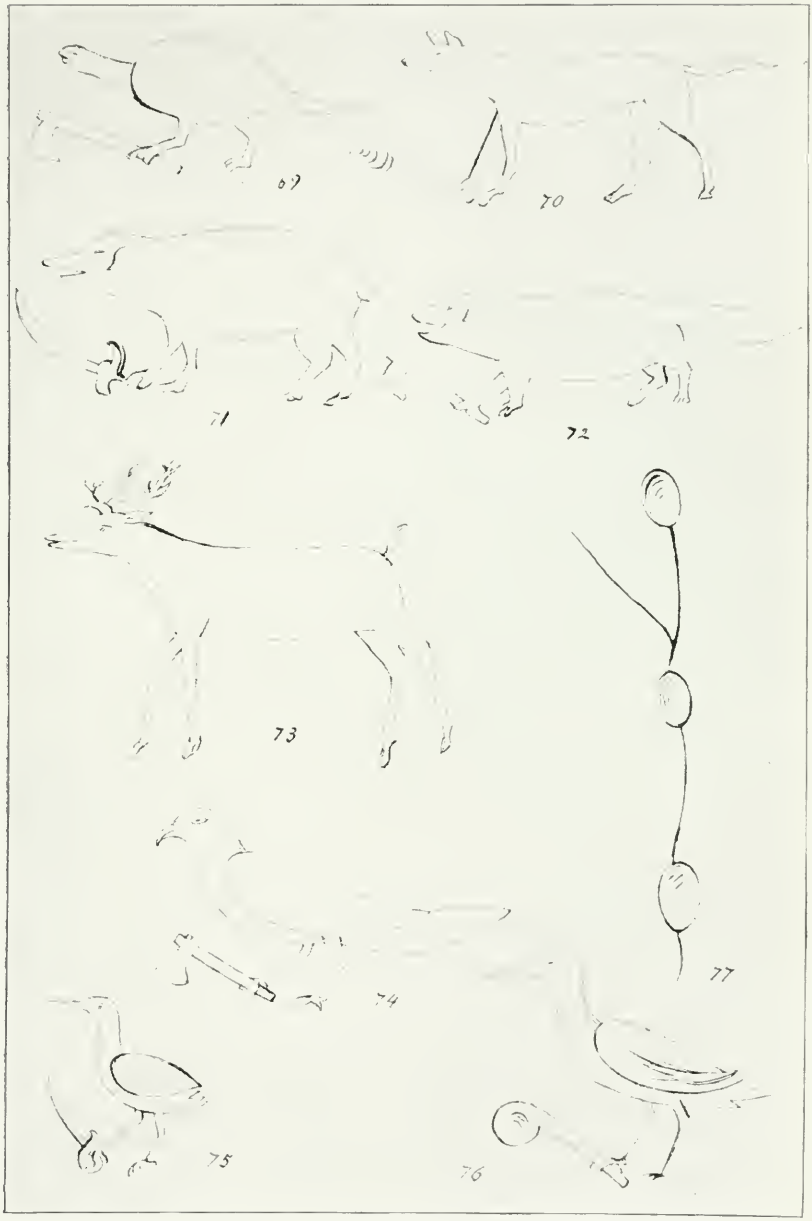


Plate 14

78 Bear and Turtle in council, they being brothers

79 Bear and Beaver in council

80 Return from war. *a*=warrior bearing scalps; *b*=a prisoner followed by his captor; *c*=gourd rattle which the prisoner carries; *d*=thongs which hold him; *e*=a man's scalp; *f*=a woman's scalp with longer hair

81 Return from hunting [*see* pl. 12, fig. 61]. This was accidentally removed from the hunter himself in figure 61. The three heads shows three does killed, being without horns. V=He has been away two days

82 Canoe going to war, the paddles showing the number of men

Plate 14

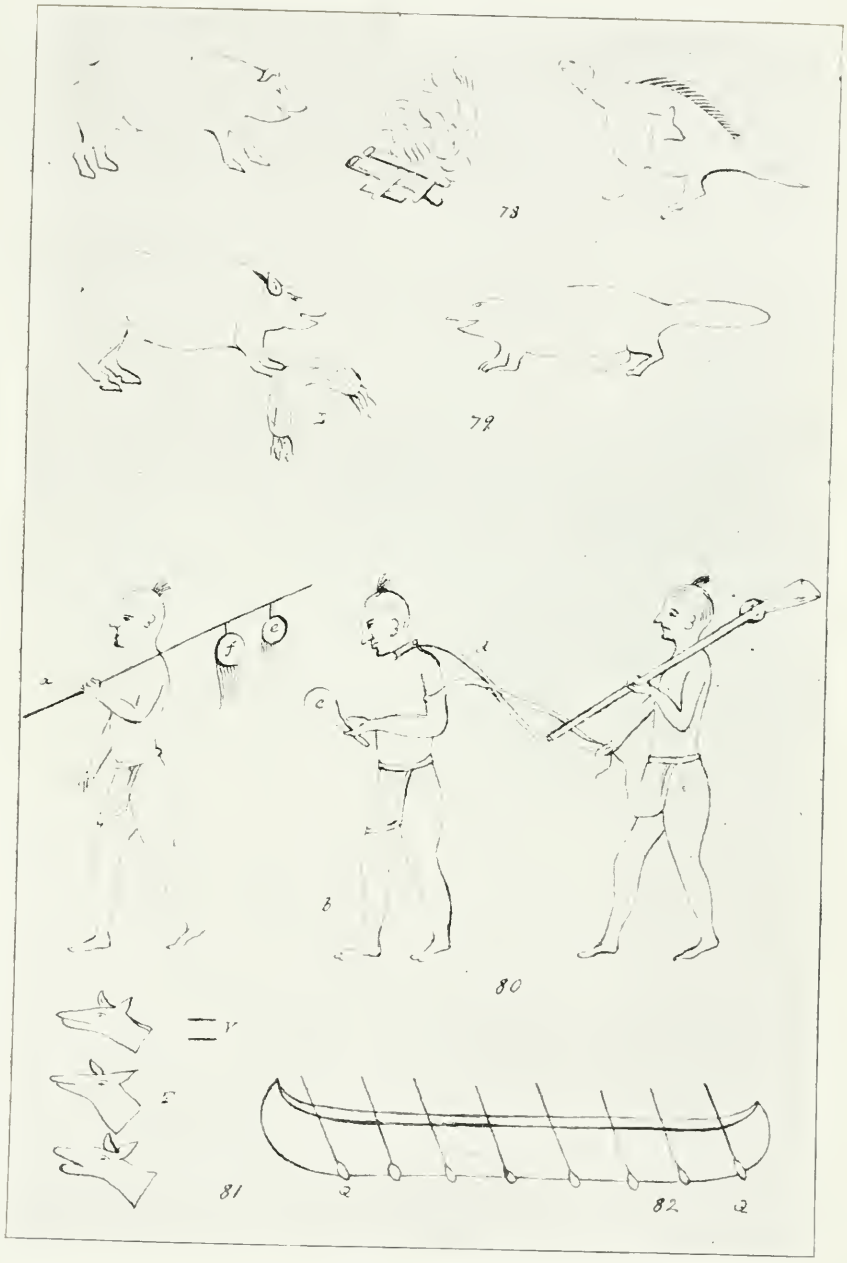


Plate 15

83 An Indian record as displayed in his cabin. *a*=number of times he has been wounded; *b*=he has been twice to war without returning; *c*=he was wounded by an arrow; *d*=he gave belts to raise a war party; *e*=he has gone back to fight before reaching home; *f*=he killed a man who had a bow and arrows; *g*=he took two men prisoners who were differently armed; *gg*=he also captured a woman; *h*=this is the way the women are distinguished from the men—by a waist cloth

Plate 15

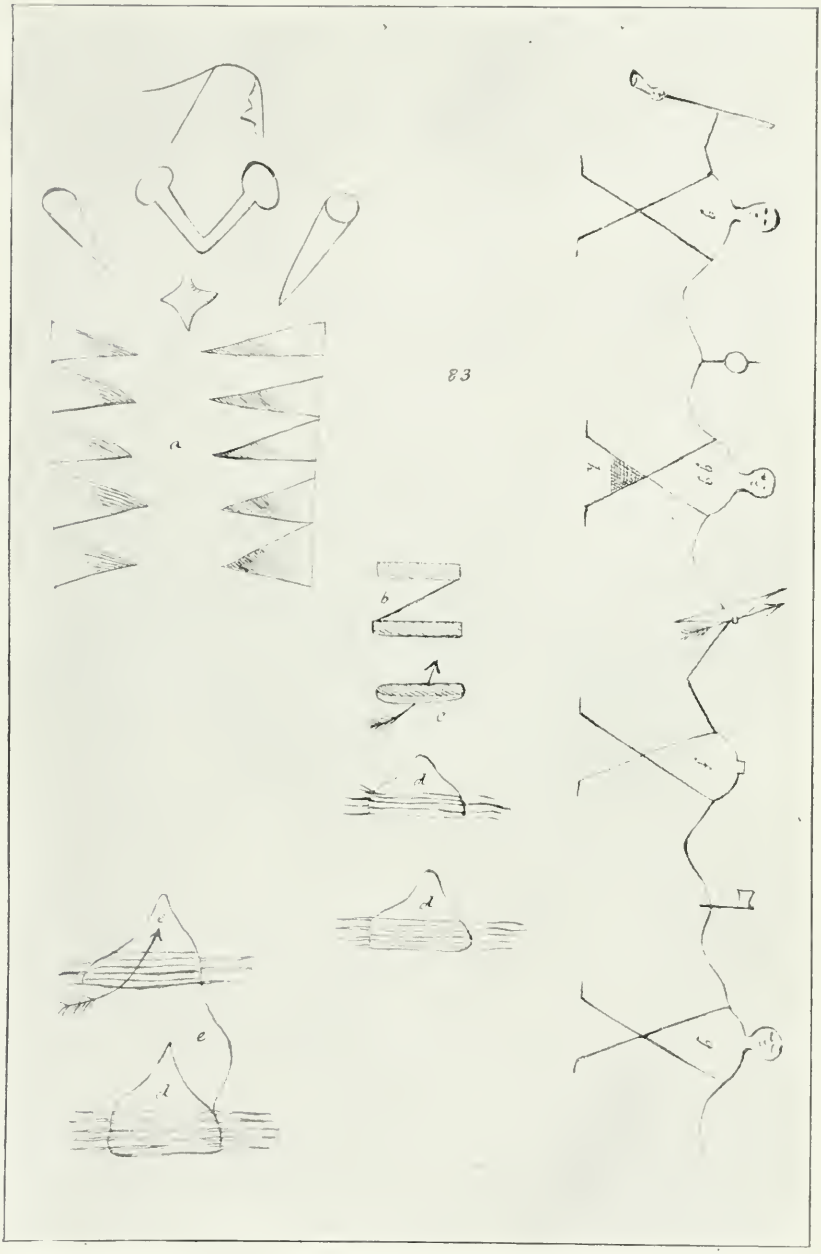
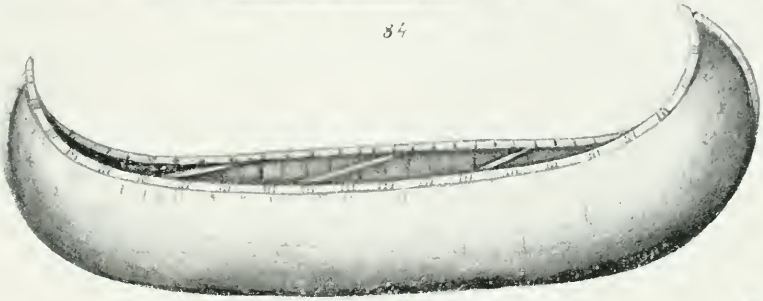


Plate 16

84 Elm bark canoe, from Morgan. This material was used by the New York Iroquois
85 Birch bark canoe of the common form for a small size
86 Pine canoe, quite generally used
87 Birch canoe, from Lahontan's picture of those used by the Algonquins
88 Elm bark canoe, figured by Lahontan as the typical form employed by the Iroquois
89 Paddle from the same writer, much like those still in use

Plate 16

84



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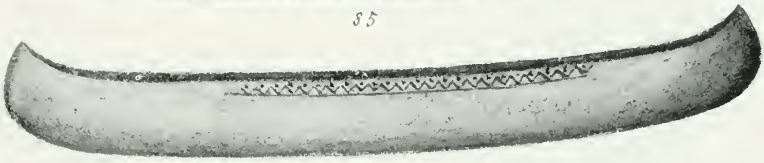

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Plate 17

90 *Canoe Building at Papper's Island*, from a picture by W. H. Bartlett, made over 60 years ago. This embraces most of the process of canoe building, but takes in other uses of birch bark. It is a Canadian scene, but just as appropriate to New York

Plate 17

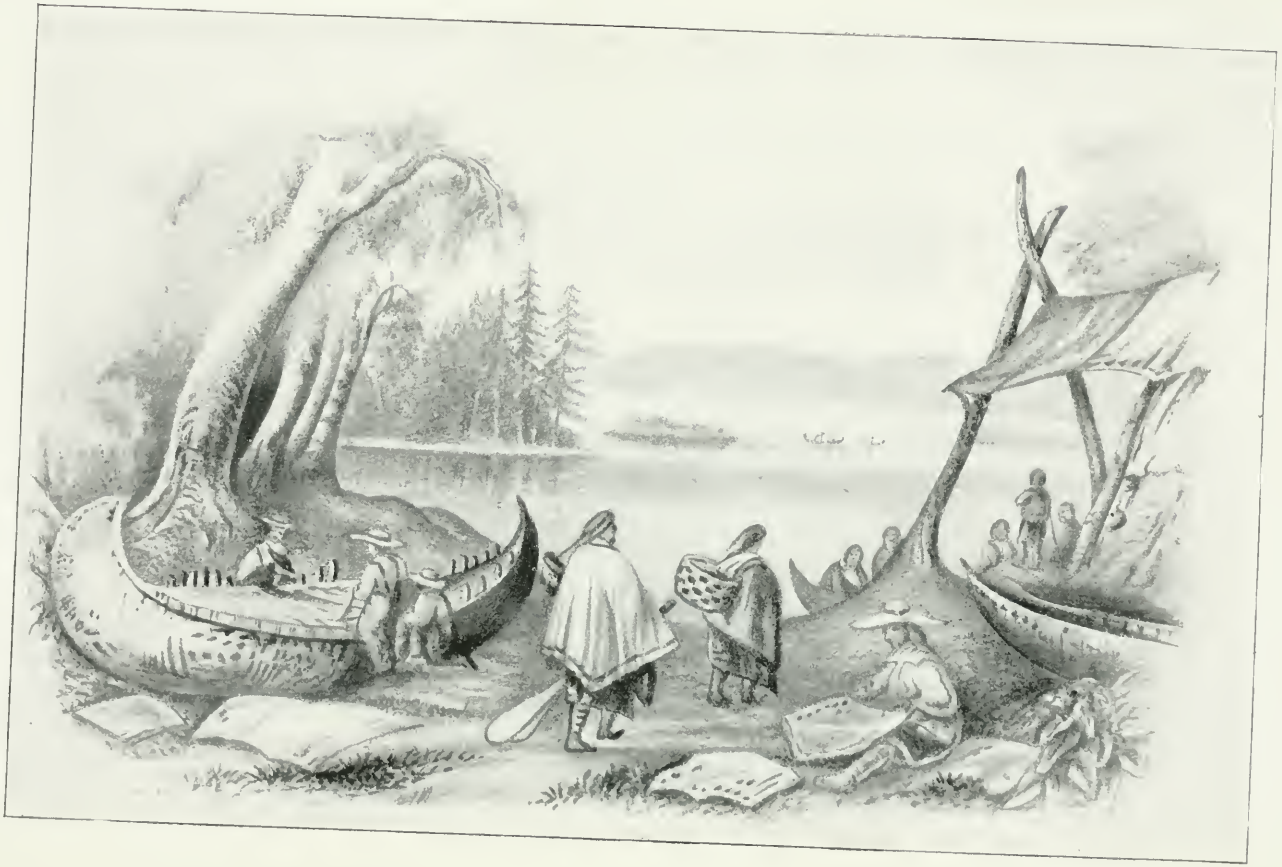


Plate 18

91 Stirring stick, used in the preparation of mush and succotash. It is now commonly made much plainer

92 Wooden ladle, once used at the great feasts at the Onondaga council house

93 Tally stick and wampum, sent out as a call for a religious council

94 Paddle from Long Island, found at Canoe Place

Plate 18

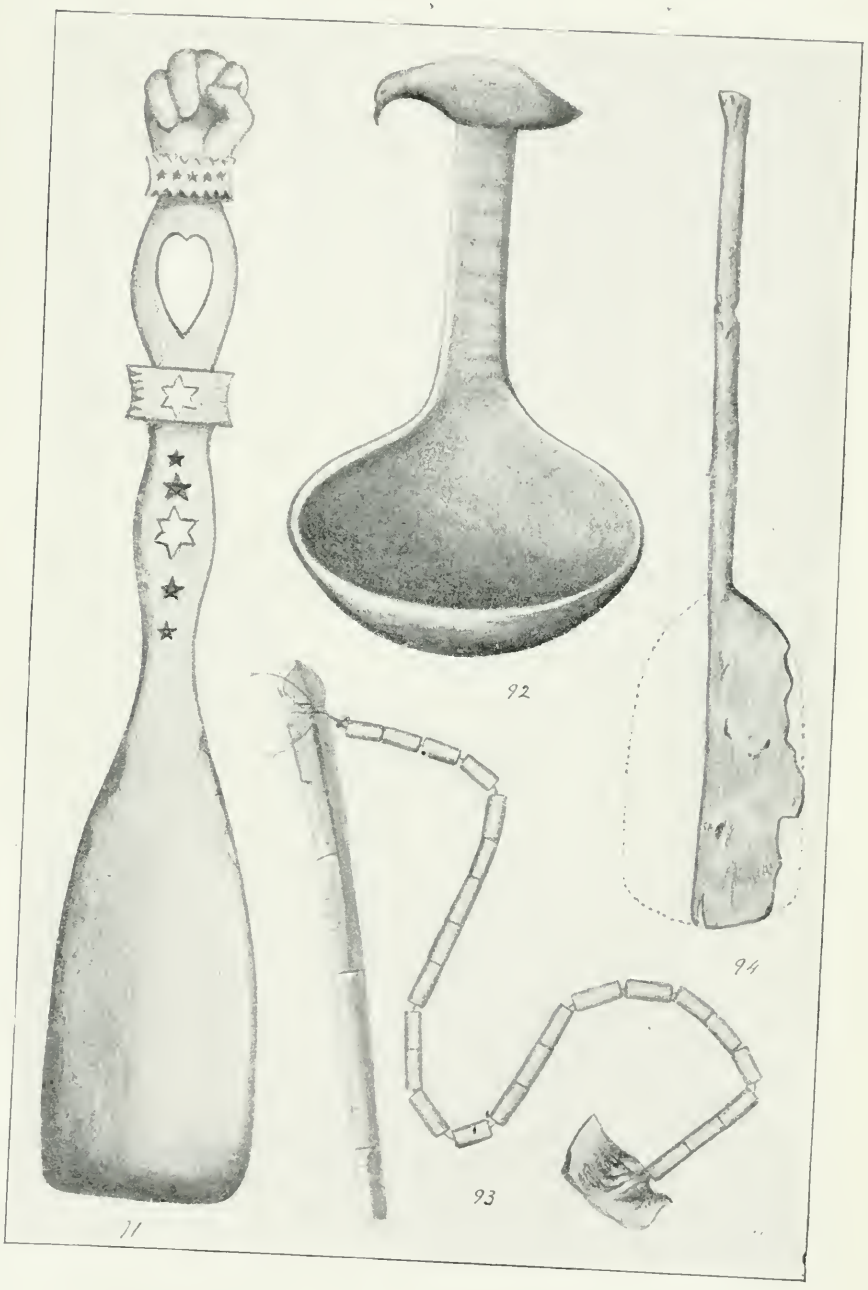


Plate 19

95 Corn husk doll, a frequent toy among the Onondagas, usually clothed
96 Bark barrel, rarely used now
97 Fish basket, another obsolete article
98 Bread turner, little used at present, though well known

Plate 19

Plate 20

99 Woman and cradle. This shows the child on the board, with the hood thrown back

100 Women pounding corn, striking alternately with their pestles. Another woman sits near, shelling beans. Such scenes are frequent

Plate 20

99

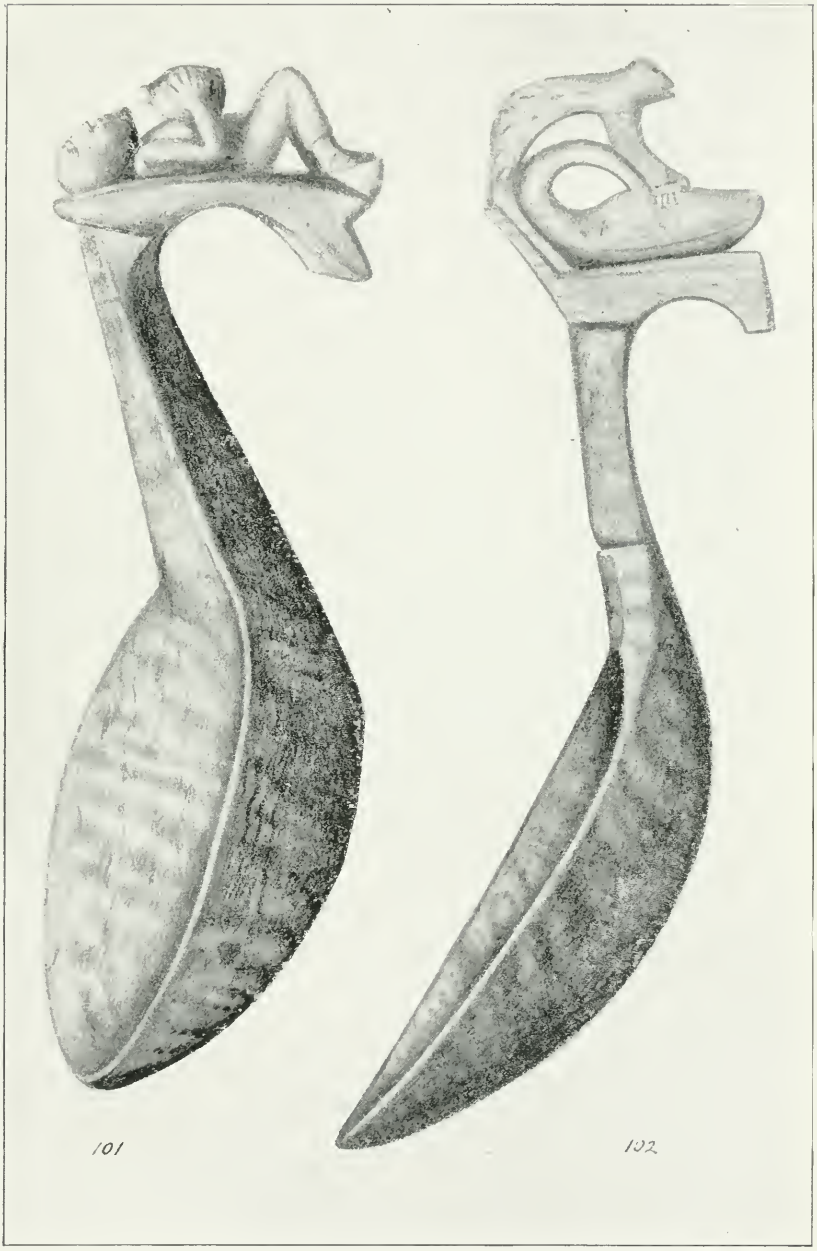
100

Plate 21

101 Wooden spoon from the Onondaga reservation, well carved and of fine material. A man lies on his back holding a jug

102 Spoon from the same reservation, also well carved. At the top of the handle a small animal has seized upon a goose or swan

Plate 21



101

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Plate 22

103 Spoon from the Onondaga reservation, finely worked and with a sleeping goose above

104 Antique spoon from an Iroquois grave and of actual size. This is imperfect, like all others from such sources

105 Charred corn, at least 400 years old

106 Antique spoon from a grave. It has lost the handle, but is otherwise well preserved. The width is 3 inches

Plate 22

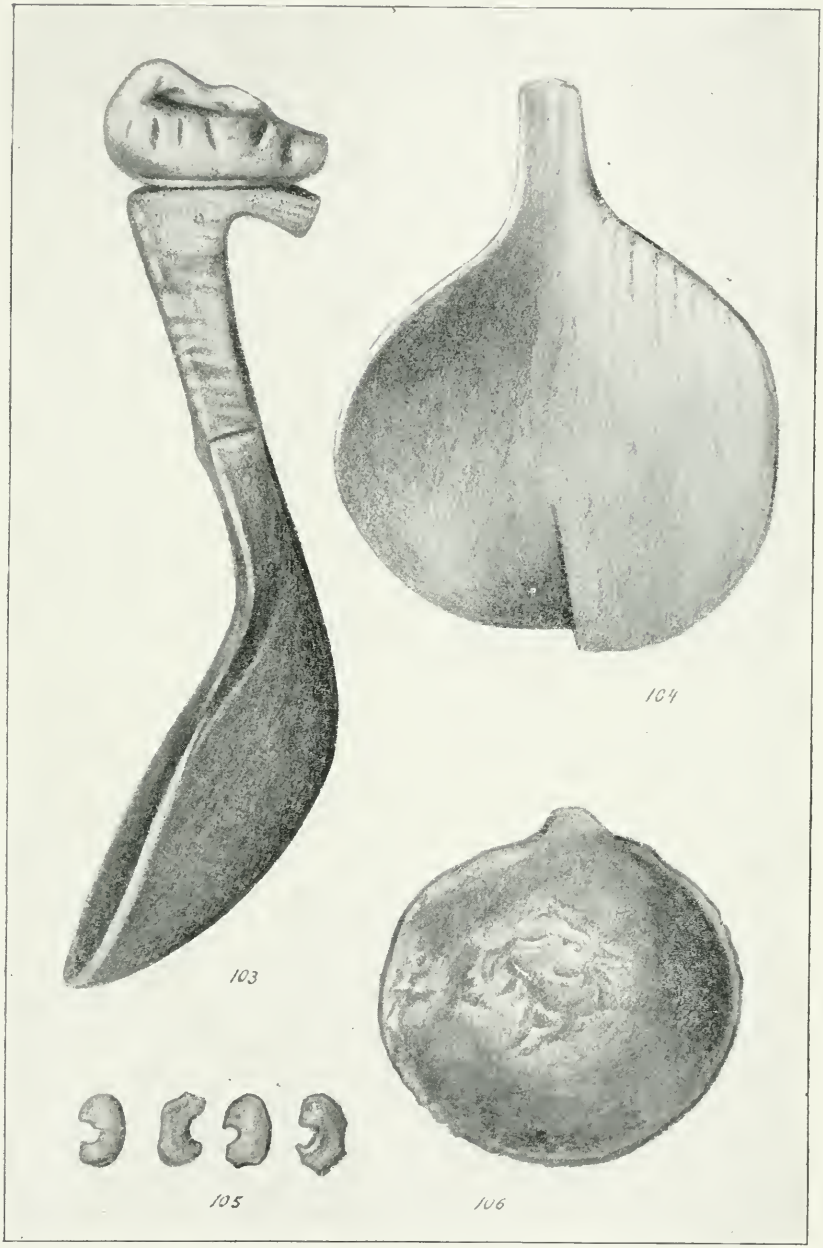

Plate 23

107 Reduced figure of wooden spoon from a grave in Ontario county, N. Y. The present length is .4½ inches, and the handle is unusually wide

108 Spoon from Ontario county grave. This has a very narrow handle

109 Small spoon from a similar grave. The width of the bowl is 3 inches, and the handle is of unusual form

110 Fine spoon from the Onondaga reservation and quite different from most others

Plate 23

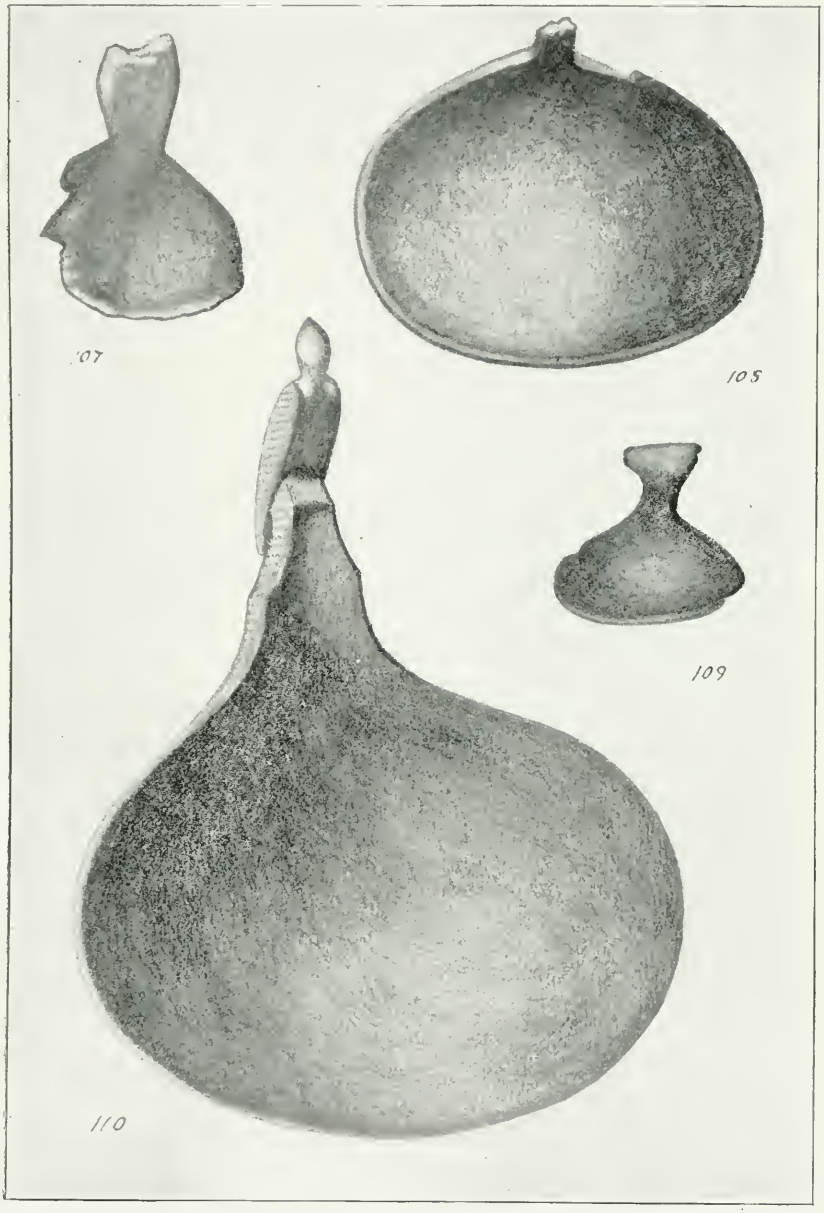

Plate 24

111 Husk salt basket of actual size, and recently made at Onondaga

112 Stirring stick of ornamental design. Being flat these are easily ornamented

113, 114 Husk salt bottles from Morgan. These figures of Seneca articles are much reduced

Plate 25

115 Bamboo whistle with slides. This was used by an Onondaga chief in making medicine

116 Wooden hook, used for suspending kettles over a fire

117 Burden frame of the best make, folded together, and with the strap attached. This was used for carrying loads on the back, and was the Indian litter

118 Lacrosse bat for playing the old game of ball. Those now used by white men have the sinews looser and require less skill

Plate 25

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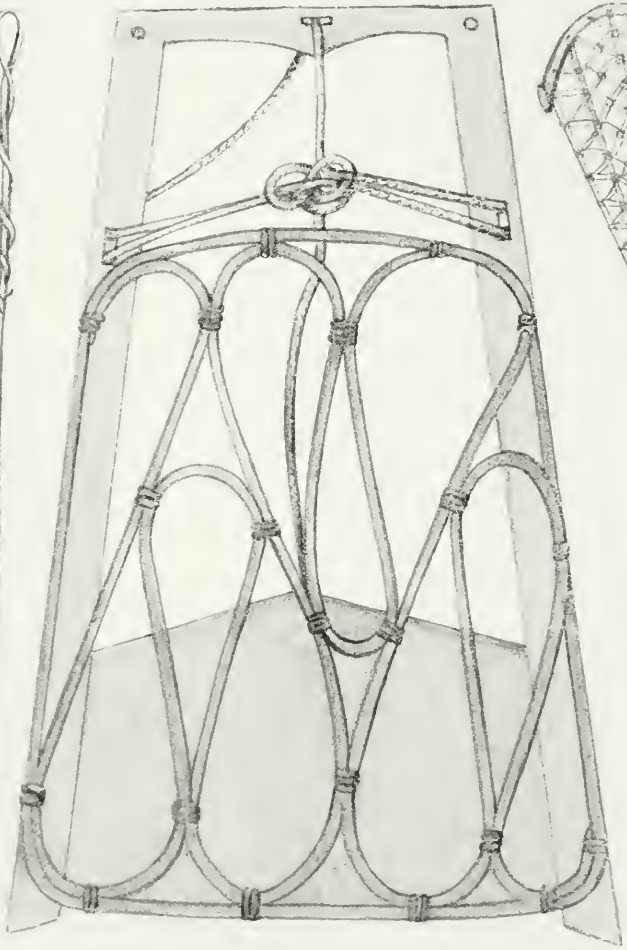

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Plate 26

119 Bark rattle, made by doubling a piece of bark. This is found on most or all reservations, but there are no early descriptions

120 Ladder from an Onondaga Indian log cabin, an antique form made by cutting notches in a post

121 Turtle-shell rattle. The handle of this is wood, strengthened by hickory splints inserted in the shell

Plate 26

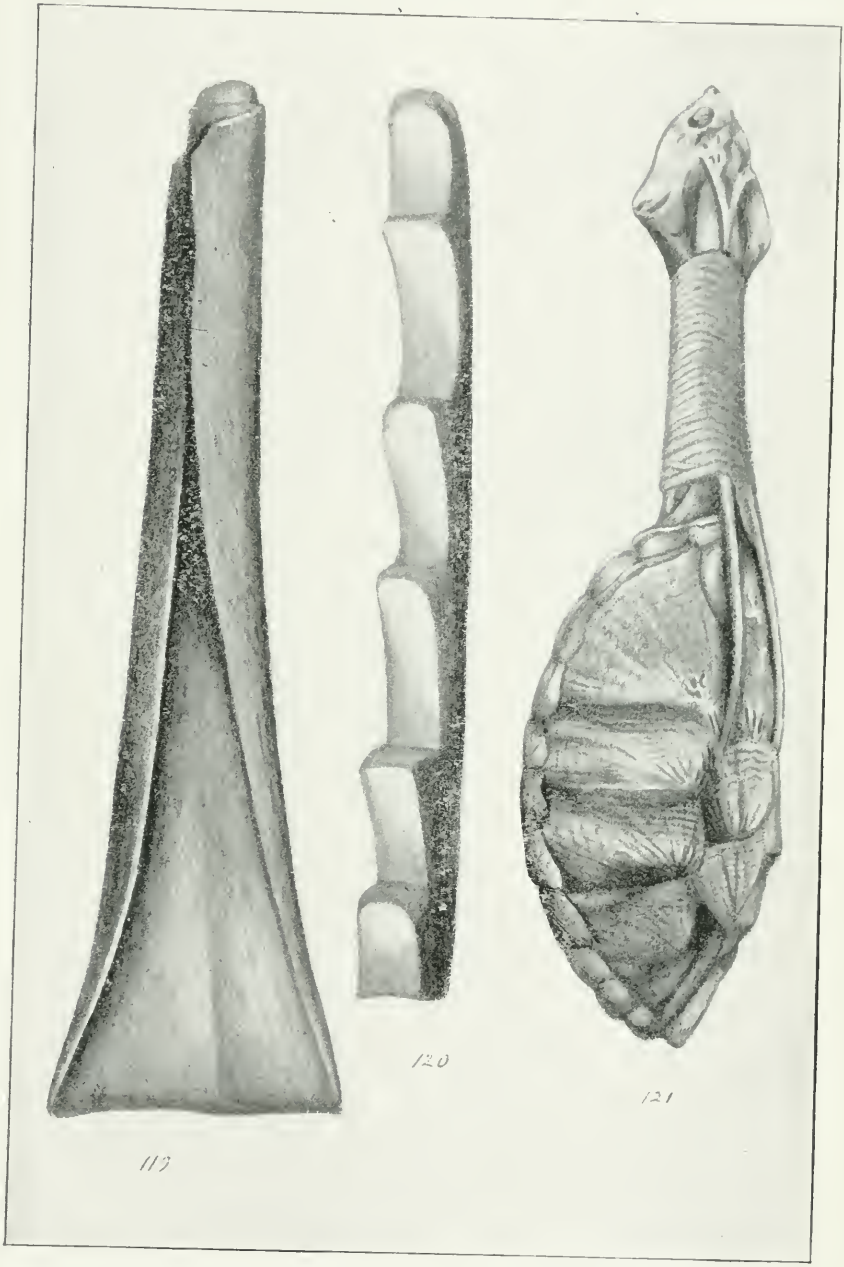

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Plate 27

122 Pattern worked on forehead or burden strap. Onondaga reservation
123 Bird snare of twine and bark from a figure by Morgan
124 Burden strap with woven pattern. Onondaga reservation. These are made of the inner bark of the elm
125 Rude burden frame, made of bent sticks and large cords. Onondaga reservation

Plate 27

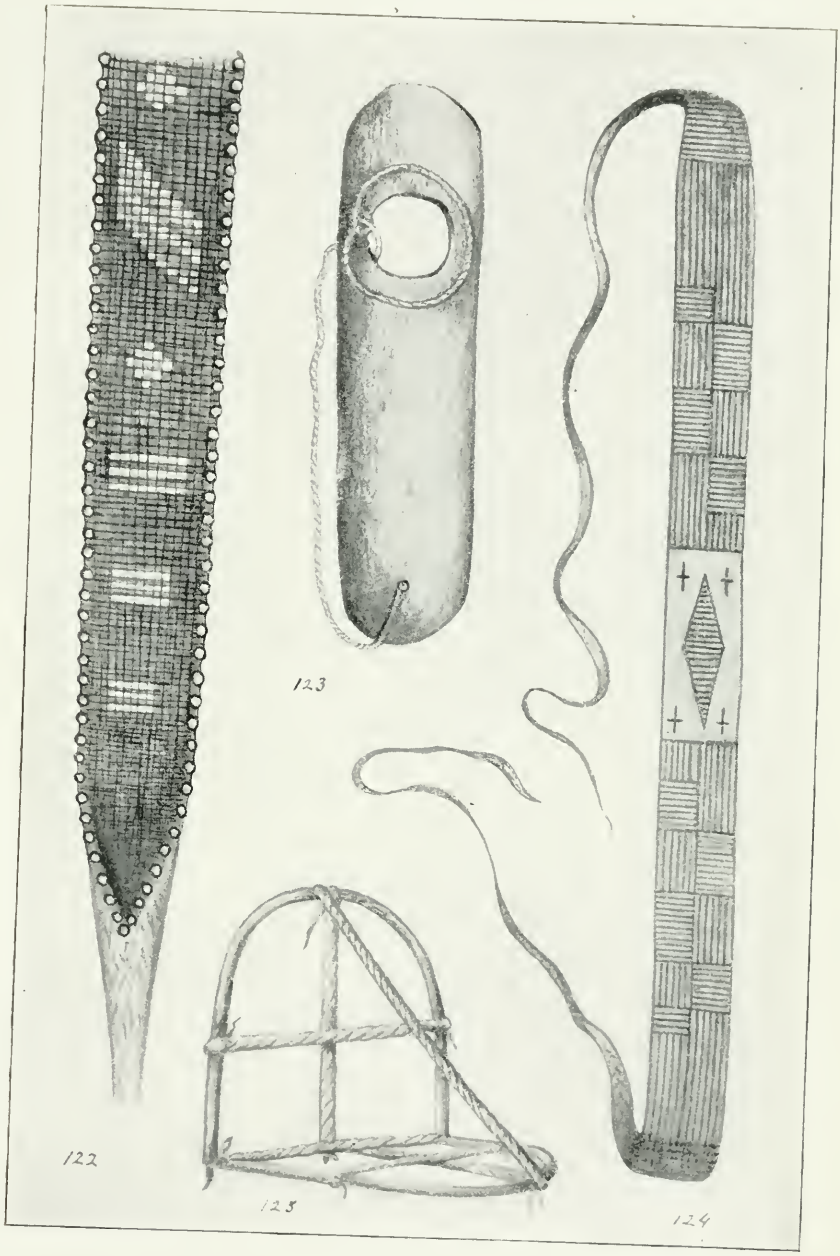


Plate 28

126 Indian cradle ready for use, but without the hood thrown over the arch

127 *a*=ornamental carving and metal work on the arch; *b*=ornamental carving on the raised sides of the cradle

128 Two views of a counting stick used in the game of the bowl. Each end is painted red

129 Another counting stick for this game, in the form of a spotted serpent

Plate 28

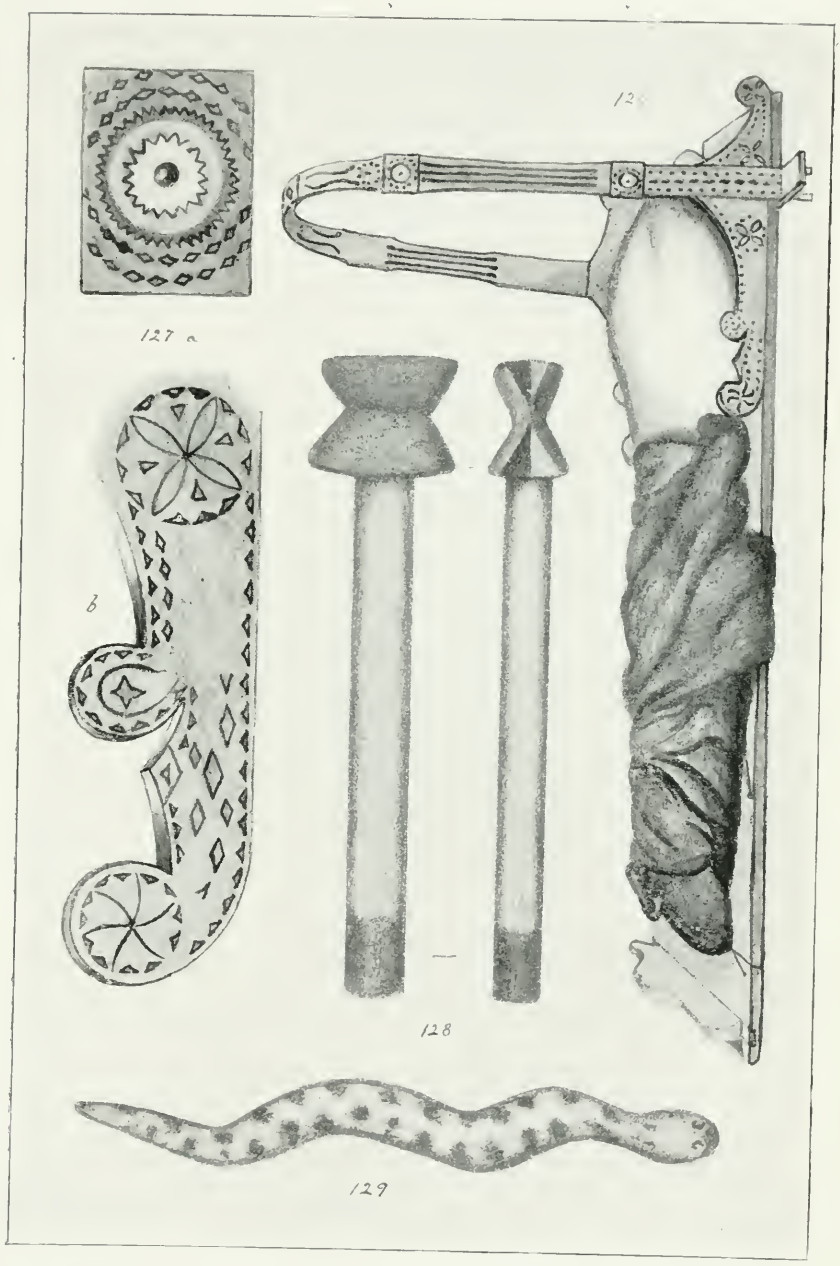


Plate 29

130 Gourd rattle with ring and plug inserted. Onondaga reservation. There are rules as to what rattles shall be used on certain occasions. This one is 12 inches long

131 Seneca gourd rattle from Morgan's figure

Plate 29

Plate 30

132 Small Indian drum, from a collection of Seneca articles at Buffalo N. Y. This is small, but of actual size

133 Elaborately carved drumstick belonging to the last. Reduced to one half the length

134 Wooden bowl used in the peach stone game, Onondaga reservation. This is old and fine. Reduced

135 Seneca bowl of another pattern, used in this game, with the stones in place. These seem flatter than usual

136 A set of peach stones, ground down and colored for use. Six are used and one side is blackened

Plate 30

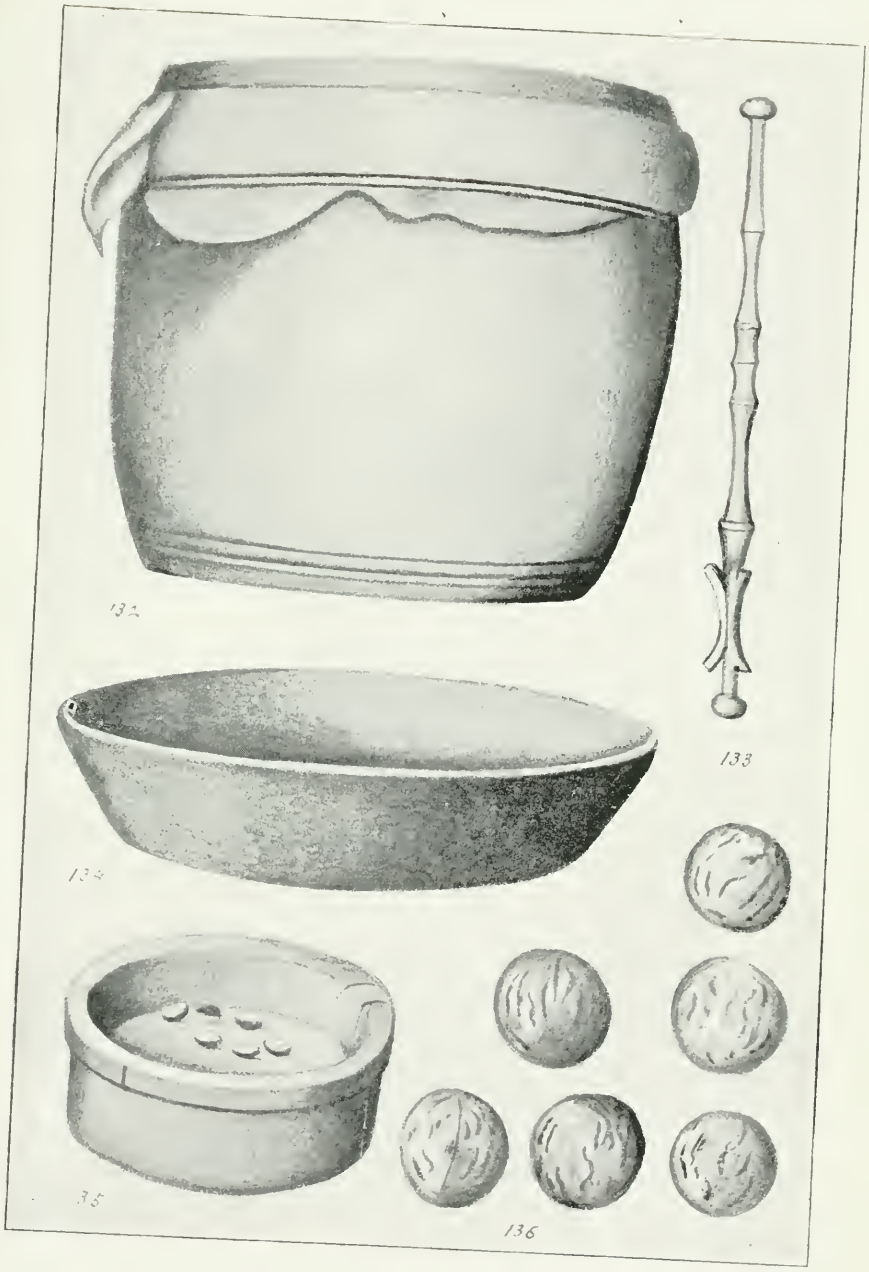


Plate 31

137 Full view of the snow-snake, the medium length of which is about 7 feet

138 Head of the snow-snake, actual size. This is weighted with lead run into grooves, and the heat from this has blackened the wood

139 Central part of the snake with an inscription. Full size, and the depth is about half the width

140 Top and side of the lower end. In the broader figure is seen the notch, in which the forefinger is placed in throwing

Plate 31

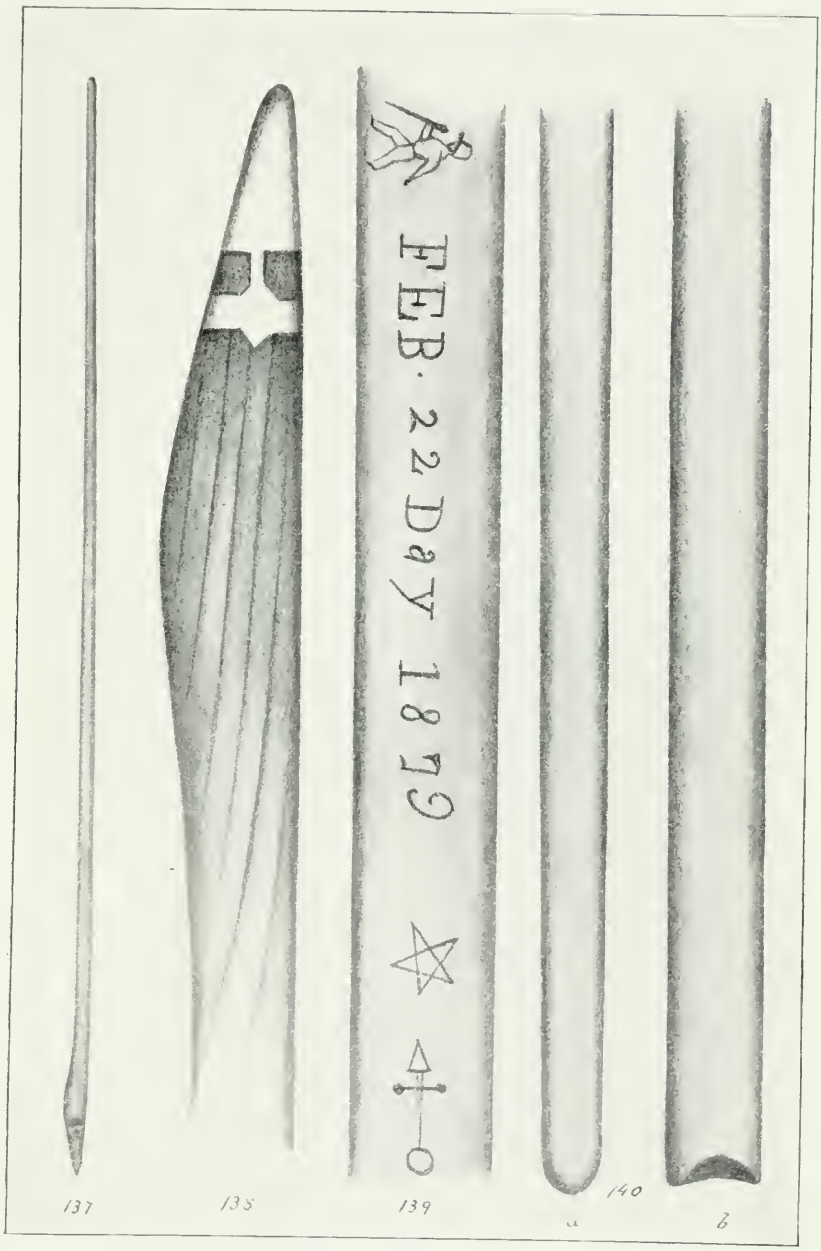


Plate 32

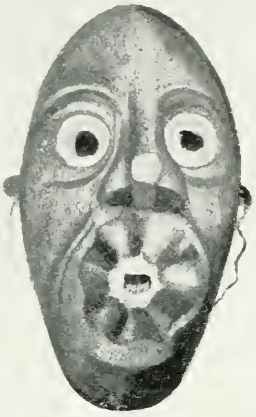
141 Iroquois false face or mask. The wearers take their name from this. This one has no hair, and the contracted and projecting mouth is a modern feature

142 This is what Mrs Converse called a maternity mask, from the small mask attached. Both the broad lips and projecting chin are modern features

143 A fine mask of the older types

144 Mask with mouth much awry. This feature is connected with a legend in both Canada and New York

Plate 32



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142

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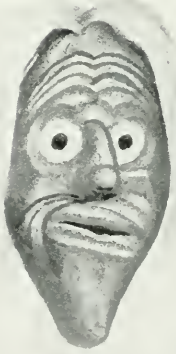

144

Plate 33

145 Mask made of corn husks, worn by doorkeeper. The looser husks represent hair

146 Another husk mask, with a braid around the face, but with no suggestion of hair

147 Onondaga False Faces on their annual winter round and grotesquely clad

148 Onondaga False Face arrayed for dancing in the council house. From a figure by De Cost Smith. He carries a rattle and staff

Plate 33

Plate 34

149 Back of carved and painted cradle board, from the Onondaga reservation, but probably made at St Regis. The carving is good and the colors bright. Very much reduced

150 A slender wooden spoon from the Onondaga reservation, which differs greatly from the earlier forms. It is over 20 years old

Plate 34

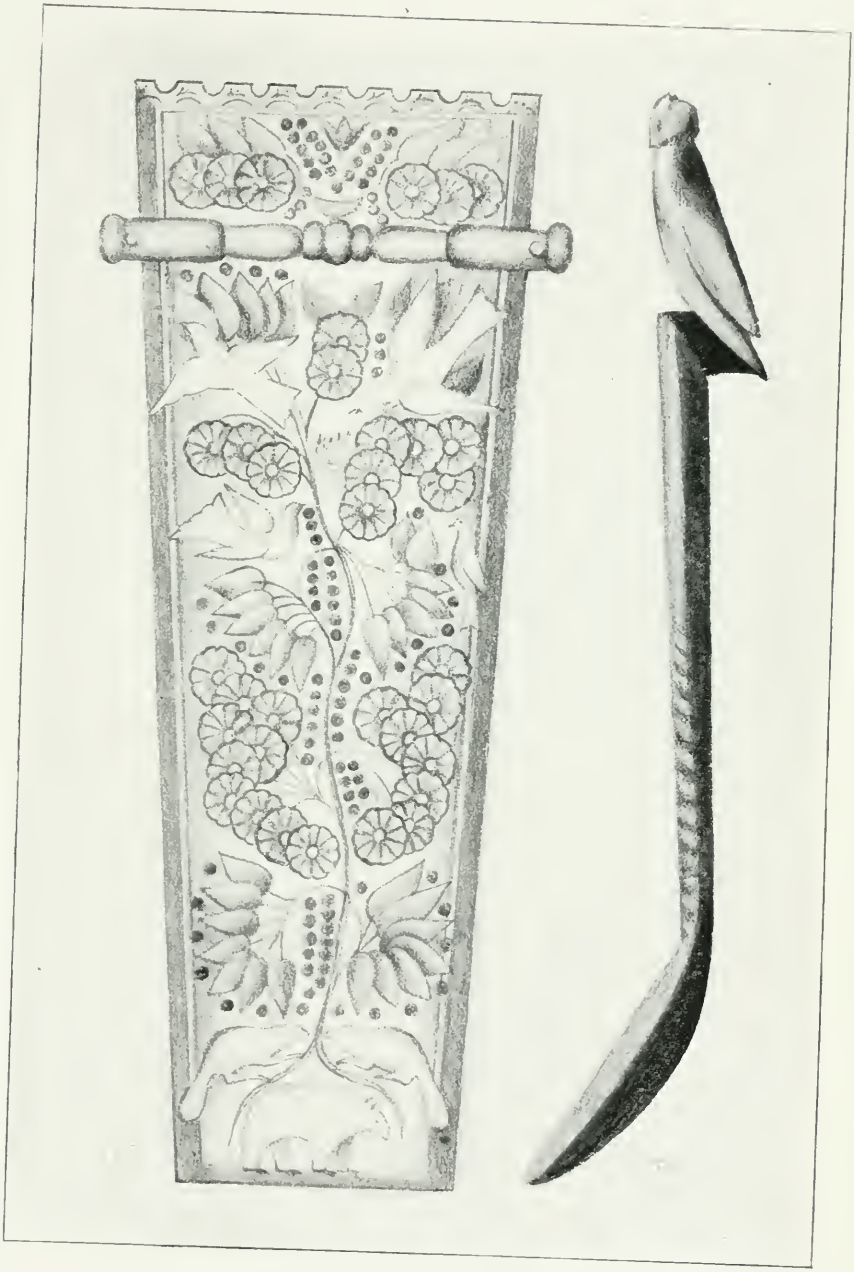

Plate 35

151 Young Onondagas throwing the snow-snake. From a photograph. They are not lined up for a contest

152 Onondaga basket maker at work outdoors. Many find pleasant and profitable employment in this way, and at St Regis it is a large industry

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Appendix 6

Botany 8

Museum bulletin 94

8 Report of the State Botanist 1904

New York State Education Department
Science Division, Jan. 16, 1905

Hon. Andrew S. Draper
Commissioner of Education:

MY DEAR SIR: I have the honor of submitting to you the following report of work done in the botanical department of the State Museum for the year 1904.

Very respectfully yours
JOHN M. CLARKE
Director

State of New York
Education Department
COMMISSIONER'S ROOM
Approved for publication Jan. 16, 1905

A. S. Draper

Commissioner of Education

New York State Museum

John M. Clarke Director
Charles H. Peck State Botanist

Bulletin 94

BOTANY 8

REPORT OF THE STATE BOTANIST 1904

Specimens of plants for the state herbarium have been collected in the counties of Albany, Columbia, Essex, Fulton, Genesee, Hamilton, Lewis, Livingston, Madison, Monroe, Otsego, Rensselaer, Saratoga, Schenectady, Suffolk, Tompkins, Warren and Wyoming.

Specimens have been contributed that were collected in the counties of Albany, Cattaraugus, Chautauqua, Dutchess, Essex, Greene, Hamilton, Herkimer, Monroe, Oneida, Onondaga, Ontario, Orleans, Richmond, Saratoga, Suffolk, Tioga, Tompkins and Washington.

The number of species of which specimens have been added to the herbarium is 321. Of these, 72 were not previously represented in it and the remaining 249 are now better or more completely represented. Of the 72 species, 9 are considered new or previously undescribed species. These are all fungi. Descriptions of them will be given in the following pages. The names of the species of which specimens have been added to the herbarium are given under the title "Plants added to the herbarium."

The names of those who have contributed specimens and the names of the species represented by their respective contributions are given under the title "Contributors and their contributions." Many of the contributed specimens belong to extralimital species. Some of the specimens of mosses and hepatics contributed by Prof. John Macoun, botanist of the Geological and Natural History Survey of Canada, represent species found in the extreme western and northwestern part of British America. In some cases, specimens sent for identification have been in good condition and desirable for the herbarium. These have been preserved and credited to the sender as a contribution. The number of contributors is 54.

In a third chapter, under the heading "Species not before reported," are the names of species new to our flora. This contains the names of a few species that had previously been recorded and were represented in the herbarium as varieties of other species, but they have now been raised to specific rank and are herein recorded as good species. Remarks concerning habitats, descriptions of new species, and the time of collecting the specimens, are given under their respective species. The number of species recorded is 80. Of these 35 belong to the genus Crataegus.

In a fourth chapter, bearing the title "Remarks and observations," there is a record of new stations of rare plants, descriptions of new varieties, remarks concerning peculiar or distinguishing features of certain plants and new names given to some species as required by the law of priority.

The number of identifications of species made for correspondents and others, who have sent or brought specimens of plants to the office of the botanist for this purpose, is 675. The number of persons for whom identifications have been made is 100.

The number of species of mushrooms that have been tried and approved as edible is 8. Descriptions of these and of a new variety of a species previously found to be edible constitute a chapter entitled "Edible fungi." Colored figures of natural size have been prepared of all these and placed on 7 plates, octavo size. The number of New York species and varieties of edible mushrooms previously reported is 153.

Colored figures of 5 new species are given on 3 similar plates. The study of our Crataegus flora has been continued, and many specimens of trees and shrubs of this genus have been collected. The specific identity of many of these has not yet been determined. Rochester and its vicinity have furnished plants from which 31 species of Crataegus have been described by Prof. C. S. Sargent. Many of these were found within the limits of the city parks. By the wise and careful forethought of Mr C. C. Laney, superintendent of parks, labels have been placed on the particular thorn trees and shrubs which furnished the material from which the descriptions of the several new species were derived. Type trees, in a genus in which many species resemble each other as closely as they do in the genus Crataegus, possess a peculiar value and importance and it is very fortunate in this instance, where so many type trees and shrubs grow in such close proximity to each other and where they can be protected, that they have been properly labeled with their botanical names. It reduces very much any danger of mistakes in their identification.

In order to collect typical flowering specimens of as many of these species as possible, this prolific locality was visited in the flowering time of these plants and specimens were collected. It was again visited in autumn and a corresponding set of fruiting specimens was collected, so that now most of the Rochester species are well and, we believe, correctly represented in the state herbarium. These specimens will serve as a standard with which to compare specimens of closely related species collected in other localities. They exhibit the specific characters in some respects with greater precision than the words of descriptions can do.

It has been observed that there is some variability in the fruit of some species even on the same shrub. The fruit on a certain shrub of C r a t a·e g u s d e l u c i d a in 1903 was small, irregular and "wormy." The present year it was noticeably larger, fair and sound. The fruit of the Graves thorn, C. g r a v e s i i, which is produced by a clump of bushes near North Albany, is variegated when mature and ripening, dull red and green colors being intermingled. Three years in succession this clump has borne fruit of this character. Its failure to ripen its fruit evenly is due to the attacks of a parasitic fungus related to, if not the same species as, the one that causes apple scab on apples. A clump of bushes of the same species growing in Tivoli hollow bears fruit that is fair and uniformly colored when ripe. It appears to be exempt from the attacks of the fungus. The fruit on some plants has been more persistent this year than it was last year. This is perhaps largely due to the absence of many of the insects that usually prey on thorn apples. It is probably also due in part to favorable weather conditions. A plentiful supply of moisture has enabled the plants to maintain their growth and vigor late in the season. The more vigorous the plant the stronger its tendency to hold its foliage and fruit. In some species the fruit regularly persists long after the leaves have fallen.

The tendency of numerous species to crowd together in certain localities is a noticeable character in these plants. It is not uncommon to find two and three species growing close to each other and intermingling their branches so intimately as to appear at first sight to be a single intricately branched individual. If specimens for the herbarium are taken from such a clump great confusion and perplexity is likely to result unless the greatest care is taken not to mingle samples from different species. But association on a larger scale excites our wonder. That there should be 41 species of Crataegus growing spontaneously in the parks of the city of Rochester and in its immediate vicinity is a remarkable fact. On

Crown Point promontory, within an area of scarcely 50 acres, 13 species have been recognized, and in a certain locality within the limits of Albany on an area of scarcely 2 acres there are 15 species of Crataegus. Certain peculiarities of these groupings of species are not devoid of interest. In the Rochester locality the section Pruinosae is represented by 8 species, though C. pruinosa, the pruinose thorn itself is absent. The section Tenuifoliae is represented there by 11 species, but in the Crown Point locality this section has no representative and the section Pruinosae has but one and that is the pruinose thorn, the very one which is absent from Rochester. Only 5 species are common to the two localities, and these are species known to have a wide distribution. The two most abundant species at Crown Point are the cockspur thorn, C. crus-galli, and the round leaved thorn, C. coccinea rotundifolia. These two species apparently constitute fully one half of all the thorn growth of the locality. Several of the other species are represented by only a few individuals each. The dotted fruited thorn, C. punctata, is one of these scantily represented species. It is a species of wide range and probably occurs in more localities in our State than any other species. If any place has but one species of thorn it is most likely to be the dotted fruited thorn. If there are but two or three species this is likely to be the most abundant one. About Albany it and the cockspur thorn are common and nearly equal in abundance. Its slight representation in the Crown Point locality is therefore somewhat strange.

The botanical department contributed specimens of 16 species of edible mushrooms to the St Louis Exposition and, through the Forestry Commission, photographs and other representations of 80 species of trees.

Mr Stewart H. Burnham was employed as temporary assistant from July 1 to Sep. 21. He has made a rearrangement of the books and pamphlets of the library, and of the duplicate and extralimital specimens of the herbarium, has put typewritten labels on the shelves of the library and of the herbarium in order to facilitate reference to books and to specimens, and has prepared typewritten labels for a series of several hundred species of fungi that are kept in pasteboard boxes, placed these labels on the boxes and arranged them alphabetically. He has also assisted in the correspondence of the office and in disinfecting specimens. By his employment it was possible to keep the office open in the absence of the botanist while engaged in field work.

PLANTS ADDED TO THE HERBARIUM

New to the herbarium

Amanita crenulata *Pk.*
A. lignophila *Atk.*
A. radicata *Pk.*
Arenaria leptoclados *Guss.*
Arisaema stewardsoni *Britton*
Boletus atkinsoni *Pk.*
B. laricinus *Berk.*
B. nobilis *Pk.*
B. rugosiceps *Pk.*
Botrychium tenebrosum *A. A. Eaton*
Bryum pendulum *Schp.*
Clavaria botrytoides *Pk.*
C. xanthosperma *Pk.*
Collybia amabilipes *Pk.*
Convolvulus repens *L.*
Cortinarius heliotropicus *Pk.*
Crataegus acclivis *Sarg.*
C. baxteri *Sarg.*
C. beata *Sarg.*
C. beckwithae *Sarg.*
C. benigna *Sarg.*
C. colorata *Sarg.*
C. compta *Sarg.*
C. cupulifera *Sarg.*
C. deweyana *Sarg.*
C. diffusa *Sarg.*
C. dunbari *Sarg.*
C. durobrivensis *Sarg.*
C. ellwangeriana *Sarg.*
C. ferentaria *Sarg.*
C. formosa *Sarg.*
C. fulleriana *Sarg.*
C. gemmosa *Sarg.*
C. glaucophylla *Sarg.*
C. hudsonica *Sarg.*
C. laneyi *Sarg.*
Crataegus leiophylla *Sarg.*
C. lennoniana *Sarg.*
C. macauleyae *Sarg.*
C. maineana *Sarg.*
C. opulens *Sarg.*
C. ornata *Sarg.*
C. parviflora *Sarg.*
C. pedicellata *Sarg.*
C. persimilis *Sarg.*
C. rubicunda *Sarg.*
C. spissiflora *Sarg.*
C. streeterae *Sarg.*
C. tenuiloba *Sarg.*
C. verecunda *Sarg.*
Craterellus taxophilus *Thom*
Dipsacus laciniatus *L.*
Eocronartium typhuloides *Atk.*
Falcata pitcheri (*T. & G.*) *Kuntze*
Fusarium aquaeductuum *R. & R.*
Galera capillaripes *Pk.*
Gyrostachys ochroleuca *Rydb.*
Hypholoma rugocephalum *Atk.*
Hypomyces banningiae *Pk.*
H. inaequalis *Pk.*
Lachnocladium semivestitum *B. & C.*
Lactarius brevis *Pk.*
L. colorascens *Pk.*
Pholiota appendiculata *Pk.*
Salix serissima (*Bail.*) *Fern.*
Sisyrinchium arenicola *Bickn.*
Stachys sieboldi *Miq.*
Teucrium boreale *Bickn.*
Viola amoena *Le Conte*
V. latiuscula *Greene*
V. septentrionalis *Greene*
Zygodesmus granulosus *Pk.*

Not new to the herbarium

Actaea rubra (*Ait.*) *Willd.*
Agaricus abruptibulbus *Pk.*
A. campester *L.*
A. subrufescens *Pk.*
Allium tricoccum *Ait.*
Alsine borealis (*Bigel.*) *Britton*
Amanita caesarea *Scop.*
A. muscaria *L.*
Amanitopsis volvata (*Pk.*) *Sacc.*
Amanitopsis vaginata (*Bull.*) *Roze*
Antennaria ambigens (*Greene*) *Fern.*
A. canadensis *Greene*
A. fallax *Greene*
A. neglecta *Greene*
A. petaloidea *Fern.*
A. plantaginea *R. Br.*
Anthemis cotula *L.*
Aquilegia vulgaris *L.*

Arenaria serpyllifolia *L.*
Arisaema triphyllum (*L.*) *Torr.*
Aristolochia clematitis *L.*
Artemisia stelleriana *Bess.*
Asplenium angustifolium *Mx.*
Asterodon ferruginosum *Pat.*
Bactridium ellisii *Berk.*
Bartonia virginica (*L.*) *B. S. P.*
Bidens frondosa *L.*
Blephariglottis ciliaris (*L.*) *Rydb.*
B. grandiflora (*Bigel.*)
Blephilia hirsuta (*Pursh*) *Torr.*
Blitum capitatum *L.*
Botrychium dissectum *Spreng.*
B. obliquum *Muhl.*
B. obliquum elongatum *G. & H.*
B. obliquum habereri *Gilb.*
B. obliquum oneidense *Clute*
B. simplex *Hitch.*
Boletinus grisellus *Pk.*
B. porosus (*Berk.*) *Pk.*
Boletus clintonianus *Pk.*
B. cyanescens *Bull.*
B. eximius *Pk.*
B. felleus *Bull.*
B. frostii *Russell*
B. illudens *Pk.*
B. nebulosus *Pk.*
B. rubropunctus *Pk.*
Bovista plumbea *Pers.*
Brassenia purpurea (*Mx.*) *Casp.*
Brassica arvensis (*L.*) *B. S. P.*
B. rapa *L.*
Callitriche heterophylla *Pursh*
Cantharellus cinnabarinus *Schw.*
C. floccosus *Schw.*
Carex castanea *Wahl.*
C. comosa *Boott*
C. crawei *Dew.*
C. formosa *Dew.*
C. hitchcockiana *Dew.*
C. lur. exundans *Bail.*
C. setifolia (*Dew.*) *Britton*
Cercospora circumscissa *Sacc.*
Chamaedaphne calyculata (*L.*)
Clavaria botrytes *Pers.*
C. cristata *Pers.*
C. platyclada *Pk.*
Claytonia caroliniana *Mx.*
Clitocybe albissima *Pk.*
C. candicans *Pers.*
C. centralis *Pk.*
C. clavipes *Pers.*
C. cyathiformis *Fr.*
C. eccentrica *Pk.*
C. ochropurpurea *Berk.*
Collybia nigrodisca *Pk.*
Convolvulus spithamaeus *L.*
Coprinus micaceus *L.*
Cornus canadensis *L.*
Cortinarius cinnamomeus *Fr.*
Crataegus holmesiana *Ashe*
C. macracantha *Lodd.*
C. pringlei *Sarg.*
C. tatnalliana *Sarg.*
C. succulenta *Lk.*
C. tomentosa *L.*
Cudonia circinans (*Pers.*) *Fr.*
C. lutea (*Pk.*) *Sacc.*
Cudoniella marcida (*Mull.*) *Sacc.*
Daedalea unicolor (*Bull.*) *Fr.*
Daphne mezereum *L.*
Dianthera americana *L.*
Diplodia conigena *Desm.*
Discina orbicularis *Pk.*
Eatonia pennsylvanica (*DC.*)
Eleocharis acicularis (*L.*) *R. & S.*
E. acuminata (*Mx.*) *Nees*
E. pal. vigens *Bail.*
E. pal. glaucescens (*Willd.*)
Eragrostis eragrostis (*L.*) *Karst.*
Eriophorum alpinum *L.*
Erythronium americanum *Ker*
Eurotium herbariorum (*Wigg.*) *Lk.*
Fagopyrum tataricum (*L.*) *Gaertn.*
Filix bulbifera (*L.*) *Underw.*
Fistulina hepatica *Fr.*
Fragaria americana (*Porter*) *Britton*
F. vesca *L.*
Fraxinus nigra *Marsh.*
Geoglossum ophioglossoides (*L.*)
G. velutipes *Pk.*
Geum canadense *Jacq.*
Gratiola aurea *Muhl.*
Gyalecta pineti (*Schrad.*) *Tuckm.*
Gyrostachys cernua (*L.*) *Kuntze*
G. stricta *Rydb.*
G. plantaginea (*Raf.*)

Helvella infula *Schaeff.*
Hieracium praealtum *Vill.*
Hudsonia tomentosa *Nutt.*
Hydnum adustum *Schw.*
H. fennicum *Karst.*
H. imbricatum *L.*
H. vellereum *Pk.*
H. zonatum *Batsch*
Hydrangea arborescens *L.*
Hygrophorus flavodiscus *Frost*
H. fuliginosus *Frost*
H. immutabilis *Pk.*
H. lau. decipiens *Pk.*
H. pratensis (*Pers.*) *Fr.*
Hypholoma incertum *Pk.*
H. sublateritium *Schaeff.*
Ilex verticillata (*L.*) *Gray*
Iris versicolor *L.*
Juncus acuminatus *Mx.*
J. balticus *Willd.*
J. brachycephalus (*Engelm.*)
J. marginatus *Rostk.*
Juniperus nanus *Willd.*
Lactarius alpinus *Pk.*
L. volemus *Fr.*
Larix laricinus (*DuRoy*) *Koch*
Lathyrus myrtifolius *Muhl.*
Lentinus lepideus *Fr.*
L. suavissimus *Fr.*
Lenzites sepiaria *Fr.*
Lepiota cepaestipes *Sow.*
Leptoglossum luteum (*Pk.*) *Sacc.*
Leptorchis loeselii (*L.*) *MacB.*
Lilium superbum *L.*
Limnorchis dil. linearifolia *Rydb.*
Lithospermum officinale *L.*
Lobelia cardinalis *L.*
Lychnis alba *Mill.*
L. chalcedonica *L.*
Lycium vulgare (*Ait.*) *Dunal*
Malus coronaria (*L.*) *Mill.*
Marasmius res. candidissimus *Pk.*
M. oreades *Fr.*
Mentha canadensis *L.*
Mikania scandens *Willd.*
Morchella bispora *Sor.*
M. deliciosa *Fr.*
Myriophyllum verticillatum *L.*
Naias flexilis (*Willd.*) *R. & S.*
Naumbergia thyrsiflora (*L.*)
Omphalia austinii *Pk.*
Onagra oakesiana (*Gr.*) *Britton*
Osmunda claytoniana *L.*
Oxalis corniculata *L.*
O. cymosa *Small*
Panax quinquefolium *L.*
Panicum lanuginosum *Ell.*
Peramium pubescens (*Willd.*)
Phacelia dubia (*L.*) *Small*
Phlox subulata *L.*
Pholiota adiposa *Fr.*
P. togularis (*Bull.*) *Fr.*
Phytophthora infestans (*Mont.*)
Picea canadensis (*Mill.*)
P. mariana (*Mill.*) *B. S. P.*
Pleurotus ostreatus (*Jacq.*) *Fr.*
P. ulmarius *Fr.*
Pluteus cervinus (*Schaeff.*) *Fr.*
Polygonum lapathifolium *L.*
Polystictus pergamenus *Fr.*
P. pseudopergamenus *Thum.*
Potamogeton natans *L.*
Potentilla argentea *L.*
Protomyces erythronii *Pk.*
Prunus americana *Marsh.*
P. cuneata *Raf.*
P. nigra *Ait.*
P. pennsylvanica *L.*
Pterospora andromedea *Nutt.*
Quercus acuminata (*Mx.*)
Q. nana (*Marsh.*) *Sarg.*
Q. prinos *L.*
Ranunculus hispidus *Mx.*
Rhamnus cathartica *L.*
Rosa sayi *Schw.*
R. setigera *Mx.*
Rubus canadensis *L.*
R. nigrobaccus *Bail.*
R. odoratus *L.*
Rudbeckia hirta *L.*
R. laciniata *L.*
Rumex acetosa *L.*
Russula compacta *Frost*
R. earlei *Pk.*
R. flavida *Frost*
R. lepida *Fr.*
R. magnifica *Pk.*
R. mariae *Pk.*
R. virescens (*Schaeff.*)

Rynchospora alba (*L.*) *Vahl*
Salix amygdaloides *Anders.*
S. pet. gracilis *Anders.*
Sarracenia purpurea *L.*
Scirpus occidentalis (*Wats.*)
S. pedicellatus *Fern.*
Scrophularia marylandica *L.*
Selaginella apus *Spring*
Silene antirrhina *L.*
S. vulgaris (*Moench*)
Sisymbrium altissimum *L.*
Sisyrinchium angustifolium *Mill.*
Smilax hispida *Muhl.*
Solidago uniligulata (*D C.*) *Porter*
Specularia perfoliata (*L.*) *D C.*
Stachys aspera *Mx.*
S. palustris *L.*
Stereum complicatum *Fr.*
S. spadiceum *Fr.*
Scleroderma vulgare *Hornem.*
Teucrium boreale *Britton*
Thymus serpyllum *L.*
Tricholoma personatum *Fr.*
Urnula craterium (*Schw.*) *Fr.*
Vagnera stellata (*L.*) *Morong*
Veronica byzantina (*S. & S.*)
Viburnum dentatum *L.*
V. lentago *L.*
V. opulus *L.*
Viola blanda *Willd.*
V. palm. dilatata *Ell.*
V. pap. domestica (*Bickn.*)
V. pubescens *Ait.*
V. rotundifolia *Mx.*
V. scabriuscula (*T. & G.*) *Schw.*
V. sororia *Willd.*
Xyris montana *Ries*
Zygadenus elegans *Pursh*

CONTRIBUTORS AND THEIR CONTRIBUTIONS

Mrs E. B. Blackford, Boston Mass
Amanita radicata *Pk.*

Mrs F. B. M. Cholwell, Old Forge
Amanita phalloides *Fr.*

Miss J. F. Conant, Melrose Mass
Hygrophorus pallidus *Pk.*

Mrs G. M. Dallas, Philadelphia Pa
Eryngium virginianum *Lam.*
Geopyxis nebulosa (*Cke.*) *Sacc.*

Mrs C. F. Davis, Falmouth Me
Clitocybe clavipes (*Pers.*) *Fr.*

Mrs M. S. De Coster, Little Falls
Daphne mezereum *L.*

Miss H. A. Edwards, Port Henry
Pterospora andromedea *Nutt.*

Miss R. C. Fish, Norwich Ct.
Clitopilus tarduus *Pk.*

Mrs L. L. Goodrich, Syracuse
Phacelia dubia (*L.*) *Small*

Miss C. C. Haynes, Highlands N. J.

Bazzania triloba (*L.*) *S. F. Gray*
Blepharostoma trichophyllum (*L.*) *Dumort.*
Cephalozia curvifolia (*Dicks.*) *Dumort.*
C. lunulaefolia *Dumort.*
Cololejeunea biddlecomiae (*Aust.*) *Evans*
Conocephalum conicum *Dumort.*
Frullania asagrayana *Mort.*
F. eboracensis *Gottsche*
Jamesoniella autumnalis (*D C.*) *Steph.*
Lepidozia reptans (*L.*) *Dumort.*
Lophozia barbata (*Schreb.*)
L. incisa (*Schrad.*)
Plagiochila asplenioides (*L.*) *Dumort.*
Porella platyphylla (*L.*) *Lindb.*
Ptilidium ciliare (*L.*) *Nees*
Radula complanata (*L.*) *Dumort.*
Scapania nemorosa (*L.*) *Dumort.*
S. undulata (*L.*) *Dumort.*
Sphenobolus exsectus (*Schm.*)
Trichocolea tomentella (*Ehrh.*)

Mrs M. A. Knickerbocker, San Francisco Cal.

Berberis pinnata *Lag.*
Chrysoma ericoides (*Less.*) *Greene*
Croton californicus *Muell.*
Garrya elliptica *Doug.*
Heteromeles arbutifolia *Roem.*
Pseudotsuga mucronata (*Raf.*)
Rhus integrifolia *B. & H.*
Ribes sanguineum *Pursh*
Sequoia sempervirens *Endl.*
Vaccinium ovatum *Pursh*

Miss J. A. Moses, Jamestown

Viola rotundifolia *Mx.*

Miss C. S. Parsons, Albany

Rudbeckia hirta *L.*

Mrs J. M. Peters, Pleasant Valley

Hypholoma sublateritium (*Schaeff.*) *Fr.*

Miss T. L. Smith, Worcester Mass.

Cantharellus brevipes *Pk.*
Clitocybe decora *Fr.*
Hexagona micropora *Murrill*
Hydnum adustum *Schw.*
H. vellereum *Pk.*
Hypocrea pallida *E. & E.*
Lepiota amianthina *Scop.*
Pleurotus porrigens (*Pers.*) *Fr.*
Polyporus pubescens *Schum.*
P. varius *Fr.*

Miss M. S. Whetstone, Minneapolis Minn

Pluteus umbrosus *Pers.*

J. C. Arthur, Lafayette Ind.

Puccinia brickelliae *Pk.*
P. malvacearum *Mont.*
Puccinia simillima *Arth.*
P. viguierae *Pk.*

G. F. Atkinson, Ithaca

Amanita caesarea *Scop.*
A. lignophila *Atk.*
A. mappa *Fr.*
Clitocybe asperulospora *Atk.*
Collybia amabilipes *Pk.*
Coprinus ebulbosus *Pk.*
Eocronartium typhuloides *Atk.*
Hydnum imbricatum *L.*
Hypholoma rugocephalum *Atk.*
Lachnocladium semivestitum *B.&C.*
Lactarius colorascens *Pk.*
Pholiota adiposa *Fr.*
Russula sordida *Pk.*
Tricholoma sulphureum (*Bull.*)
Uredinopsis atkinsonii *Magn.*
U. osmundae *Magn.*

A. M. Baker, Irondequoit

Geaster triplex *Jungh.*

H. J. Banker, California Pa.

Physalacria inflata (*Schw.*) *Pk.*
Scorias spongiosa (*Schw.*) *Fr.*

E. Bartholomew, Rockport Kan.

Uromyces gaurinus (*Pk.*) *Long*
Uromyces oenotherae *Burrill*

F. S. Boughton, Pittsford

Hyphomyces banningiae *Pk.*

F. J. Braendle, Washington D. C.

Cortinarius braendlei *Pk.*
Phallus imperialis *Schulz.*
Thelephora palmata *Scop.*
Torrubia militaris (*L.*) *Lk.*

E. Brainerd, Middlebury Vt.

Viola cucullata *Ait.*
V. latiuscula *Greene*
V. obliqua *Hill*
Viola palmata dilatata *Ell.*
V. septentrionalis *Greene*
V. sororia *Willd.*

S. H. Burnham, Vaughns

Aronia atropurpurea *Britton*
Aster lat. thyrsoidea (*Gr.*) *Sheldon*
Bidens frondosa *L.*
Favolus europaeus *Fr.*
Gyrostachya ochroleuca *Rydb.*
Hebeloma illicitum *Pk.*
Hieracium marianum *Willd.*
Hypomyces lactifluorum *Schw.*
Monarda punctata *L.*
Nabalus altissimus (*L.*) *Hook.*
Polyporus elegans *Fr.*
P. pallidus *S. & K.*
Rhus glab. borealis *Britton*
Rosa sayi *Schw.*
Salix pet. gracilis *Anders.*
Sisyrinchium arenicola *Bickn.*
Stachys sieboldi *Miq.*
Steironema lanceolatum (*Walt.*)
Thymus serpyllum *L.*
Trametes rubescens *Fr.*
Tremella fuciformis *Berk.*
Tricholoma personatum *Fr.*
Urnula craterium (*Schw.*) *Fr.*
Vicia angustifolia *Roth*

G. D. Cornell, Cooper's Plains

Panax quinquefolium *L.*

S. Davis, Boston Mass.

Agaricus comtulus *Fr.*
Clitocybe brumalis *Fr.*
Hypholoma incertum *Pk.*
Pholiota togularis (*Bull.*) *Fr.*
Tricholoma pallidum *Pk.*
T. terr. fragrans *Pk.*

F. Dobbin, Shushan

Convolvulus repens *L.*
C. spithamaeus *L.*
Stemonitis fusca *Roth*

C. E. Fairmar, Lyndonville

Armillaria nardosmia *Ellis*
Clitocybe eccentrica *Pk.*
Hydnum spongiosipes *Pk.*
Russula crustosa *Pk.*

F. E. Fenno, Nichols

Crataegus tomentosa *L.*
Juncus acuminatus *Mx.*
J. balticus *Willd.*
J. brachycephalus (*Engelm.*)
J. marginatus *Rostk.*
Lobelia kalmii *L.*
Panicum xanthophysum *Gray*
Parnassia caroliniana *Mx.*
Polygala viridescens *L.*
Polygonum lapathifolium *L.*
Roripa sylvestris (*L.*) *Bess.*
Rosa setigera *Mx.*
Rynchospora alba (*L.*) *Vahl.*
R. capillacea *Torr.*
Scirpus pedicellatus *Fern.*
Silene vulgaris (*Moench*) *Garcke*
Smilax hispida *Muhl.*
Solidago uniligulata (*D C.*)*Porter*

G. B. Fessenden, Boston Mass.

Lactarius regalis *Pk.*

B. D. Gilbert, Clayville

Bryum pendulum *Schp.*
Camptothecium nitens *Schp.*

N. M. Glatfelter, St Louis Mo.

Gyromitra brunnea *Underw.*
Panus meruliiceps *Pk.*

C. C. Hanmer, East Hartford Ct.

Guepinia spathularia *Schw.*

J. V. Haberer, Utica

Achroanthes monophylla (*L.*) *Greene*
A. unifolia (*Mx.*) *Raf.*
Adopogon carolinianum *Britton*
Alsine borealis (*Bigel.*) *Britton*
Arenaria leptoclados *Guss.*
A. serpyllifolia *L.*
Antennaria canadensis *Greene*
A. fallax *Greene*
A. neglecta *Greene*
A. parlinii *Fern.*
A. petaloides *Fern.*
A. plantaginea *B. Br.*
Artemisia stelleriana *Bess.*
Asclepias tuberosa *L.*
Bartonia virginica (*L.*) *B. S. P.*
Blephariglottis grandiflora (*Bigel.*)
Botrychium dissectum *Spreng.*
B. obliquum *Muhl.*
B. obliquum elongatum *G. & H.*
B obliquum habereri *Gilb.*
B. obliquum oneidense *Clute*
B. simplex *Hitch.*
B. tenebrosum *Eaton*
Callitriche heterophylla *Pursh*
Ceanothus americanus *L.*
Fragaria vesca *L.*
Galium mollugo *L.*
Geranium bicknellii *Britton*
Gyrostachys cernua (*L.*)
G. ochroleuca *Rydb.*
G. plantaginea (*Raf.*)
G. praecox (*Walt.*) *Kuntze*
G. stricta *Rydb.*
Lactuca virosa *L.*
Leptorchis loeselii (*L.*) *MacM.*
Limnorchis dil. linearifolia *Rydb.*
Lycopodium tristachyum *Pursh*
Lysimachia terrestris (*L.*) *B. S. P.*
Myriophyllum verticillatum *L.*
Naias flexilis (*Willd.*) *R. & S.*
Oxalis corniculata *L.*
Peramium pubescens (*Willd.*)
Polygonella articulata (*L.*)
Rhamnus cathartica *L.*
Rumex acetosa *L.*
Scrophularia marylandica *L.*
Selaginella apus *Spring*
Silene antirrhina *L.*
Sorbus aucuparia *L.*
Specularia perfoliata (*L.*) *D C.*
Stachys palustris *L.*
S. aspera *Mx.*
Teucrium boreale *Bickn.*
Valeriana uliginosa *Rydb.*
Verbascum lychnidis *L.*
Xyris montana *Ries*

W. Herriot, Galt Ont.

Carex lupuliformis *Sart.*
Leontodon hispidus *L.*
Linaria minor *Desf.*

H. H. Hindshaw, Albany

Anthoceros laevis *L.*
Bulgaria inquinans *Fr.*

E. A. Lehman, Winston-Salem N. C.

Merulius lacrymans (*Jacq.*) *Fr.*

R. B. Mackintosh, Peabody Mass.

Boletus parasiticus *Bull.*
B. rubropunctus *Pk.*
Hydnum fennicum *Karst.*
Hydnum vellereum *Pk.*
Lepiota rhacodes (*Vitt.*) *Fr.*

J. Macoun, Ottawa Can.

Amblystegium fluviatile *B. & S.*
A. subcompactum *C. M. & K.*
Andraea petrophila *Ehrh.*
Aneura latifrons *Lindb.*
A. pinguis *Dumort.*
Anthoceros laevis *L.*
Aulacomnion palustre (*L.*) *Schwaegr.*
A. palustre imbricatum *B. & S.*
A. palustre subimbricatum *Kindb.*
A. turgidum (*Wahl.*)
Barbula circinnatula *C. M. & K.*
B. convoluta *Hedw.*
Bazzania trilobata (*L.*) *S. F. Gray*
Biatora uliginosa (*Schrad.*) *Fr.*
Blepharostoma setiforme (*Ehrh.*)
B. trichophyllum (*L.*)
Brachythecium glareosum *Bruch*
B. salebrosum *B. & S.*
Bryum arcticum *B. & S.*
B. auromontanum *Kindb.*
B. caespiticium *L.*
B. capillare *L.*
B. cirrhatum *H. & H.*
B. cyclophyllum *B. & S.*
B. dawsoniense *Will.*
B. duvalii *Voit*
B. ery. gaspeanum *Kindb.*
B. haematophyllum *Kindb.*
B. intermedium *Brid*
B. klondikense *Kindb.*
B. micans *Limpr.*
B. mucronigerum *Philib.*
Bryum pseudotriquetrum *Schwaegr.*
Calliergon cordifolium *Hedw.*
C. giganteum *Schp.*
C. stramineum *Dicks.*
C. subgiganteum *Kindb.*
Camptothecium nitens *Schreb.*
C. nitens microthecium *Kindb.*
Campylium stellatum *Schreb.*
Catascopium nigritum *Brid.*
Cephalozia bicuspidata (*L.*)
C. leucantha *Spruce*
C. media *Lindb.*
C. pleniceps (*Aust.*)
Ceratodon columbiae *Kindb.*
Chiloscyphus polyanthos *Cd.*
Climacium dendroides *W. & M.*
Corticium canadense *Burt*
C. calc. glebulosum *Fr.*
C. croceum (*Kunze*)
C. crustaceum *Karst.*
C. effuscatum *C. & E.*
C. galactinum (*Fr.*) *Burt*
C. greschikii *Bres.*
C. pinicolum *Tul.*
Cynodontium strumiferum *Ehrh.*
C. torquescens (*Bruch*)
C. wahlenbergii (*Brid.*)
Dicranella crispa *Schp.*
D. secunda (*Sw.*) *Lindb.*
Dicranum bergeri *Bland.*
D. bergeri brevifolium *Lindb.*
D. bergeri rupincola *Kindb.*
D. elongatum *Schwaegr.*

Dicranum elongatum attenuatum *Kindb.*
D. elongatum subfragilifolium *K.*
D. fragilifolium *Lindb.*
D. fuscescens *Turn.*
D. leioneuron *Kindb.*
D. muehlenbeckii *B. & S.*
D. schisti *Lindb.*
D. spadiceum *Zett*
D. sphagni *Wahl.*
D. subpalustre *C. M. & K.*
D. sulcatum *Kindb.*
Didymodon baden-powelli *Kindb.*
Diplophylleia albicans (*L.*) *Trev.*
D. taxifolia (*Wahl.*) *Trev.*
Distichum capillaceum *B. & S.*
Ditrichum flex. densum *Kindb.*
D. inclinatum *Ehrh.*
D. macouni *C. M. & K.*
D. pallidum *Hampe*
Eurhynchium edentulum *Kindb.*
E. strigosum (*Hoffm.*)
E. strigosum praecox *Hedw.*
E. strigosum robustum *Kindb.*
Fissidens grandifrons *Brid.*
F. osmundoides (*Sw.*)
Fontinalis hypnoides *Hartm.*
F. novae-angliae *Sulliv.*
F. squamosa *L.*
Fossombronia foveolata *Lindb.*
Frullania eboracensis *Gotts.*
Grandinia papillata *B. & C.*
Gymnomitrium coralloides *Nees*
Hymenochaete corrugata *Fr.*
Hypnum aduncum *L.*
H. amblyphyllum *Will.*
H. cupressiforme *L.*
H. exannulatum *Guemb.*
H. fluitans *L.*
H. kneiffia *B. & S.*
H. molluscoides *Kindb.*
H. plumiferum *Mitt.*
H. revolvens *Swartz*
H. rugosum *L.*
H. schreberi *Willd.*
H. subimponens *Lesq.*
H. uncinatum *Hedw.*
Isothecium myosuroides (*L.*) *Brid.*
Kantia trichomanes (*L.*) *S. F. Gray*
Lecanora elatina *Ach.*
L. elatina ochrophaea *Tuckm.*
L. pallescens (*L.*) *Schaer.*
Leptobryum pyriforme (*L.*) *Schp.*
Lophocolea foveolata *Lindb.*
L. minor *Nees*
Lophozia barbata (*Schreb.*)
L. floerkii (*W. & M.*)
L. inflata (*Huds.*)
L. kunzeana *Hueben.*
L. lyoni *Tayl.*
L. minuta *Crantz*
L. rutheana *Limpr.*
L. saxicola (*Schrad.*)
L. ventricosa (*Dicks.*)
Meesia albertini *B. & S.*
M. trichodes (*L.*) *Spruce*
M. uliginosa *Hedw.*
Merulius bellus *B. & C.*
Mnium blyttii *B. & S.*
M. hymenophyllum *Bry. Eur.*
M. macouni *Kindb.*
M. macrophyllum *Kindb.*
M. medium *B. & S.*
M. pseudolycopodioides *C. M. & K.*
M. rugicum *Laur.*
M. subglobosum *B. & S.*
Myurella apiculata *B. & S.*
M. julacea *B. & S.*
Odontoschisma macouni *Aust.*
Orthotrichum anomalum *Hedw.*
O. porteri *Aust.*
O. schimperi *Hamm.*
Pallavicinia lyellii (*Hook.*)
Paludella squarrosa (*L.*) *Brid.*
Peniophora cinerea (*Fr.*)
Phascum cuspidatum *Schreb.*
Philonotis aciculare-pungens *C. M. & K.*
P. alpicola *Jurat.*
P. font.microthamniae *Kindb.*
P. trichophorum (*Spruce*)
Polytrichum hyperboreum *R. Br.*
P. juniperinum *Willd.*
P. juniperinum alpinum *Kindb.*
P. piliferum *Schreb.*

Polytrichum strictum *Banks*
Porella pinnata *L.*
Pseudoleskea malacoclada *C. M. & K.*
Psilopilum glabratum *Lindb.*
Ptilidium ciliare (*L.*) *Nees*
Saxicola lophozioides *Evans*
Scouleria muelleri *Kindb.*
Sebacina calcea (*Pers.*) *Bres.*
Sphagnum acutifolium *R. & W.*
Sphagnum girgensohni *Russ.*
S. medium *Limpr.*
Stereum sulcatum *Burt*
S. tuberculosum *Fr.*
Thuidium abietinum *B. & S.*
Thuidium philiberti *Limpr.*
Webera albicans *Schp.*
W. annotinum *Schwaegr.*
W. cruda *Schp.*
W nutans *Hedw.*

C. McIlvaine, Cambridge Md.

Lentinus vulpinus *Fr.*
Simblum rubescens *Ger.*

F. H. Mickleborough, Brooklyn

Hypomyces inaequalis *Pk.*

G. E. Morris, Waltham Mass.

Agaricus micromegethus *Pk.*
Boletinus grisellus *Pk.*
Cortinarius morrisii *Pk.*
Hydnum adustum *Schw.*

C. H. Prescott, Albany

Boletus clintonianus *Pk.*
Boletus laricinus *Berk.*

C. S. Sargent, Jamaica Plain Mass.

Crataegus acclivis *Sarg.*
C. baxteri *Sarg.*
C. beata *Sarg.*
C benigna *Sarg.*
C colorata *Sarg.*
C. compta *Sarg.*
C. conjuncta *Sarg.*
C. cupulifera *Sarg.*
C. deweyana *Sarg.*
C. diffusa *Sarg.*
C. dunbari *Sarg.*
C. durobrivensis *Sarg.*
C. ellwangeriana *Sarg.*
C. ferentaria *Sarg.*
C. forbesiae *Sarg.*
C. formosa *Sarg.*
C. fucosa *Sarg.*
C. gemmosa *Sarg.*
C. glaucophylla *Sarg.*
C. laneyi *Sarg.*
Crataegus leiophylla *Sarg.*
C. lennoniana *Sarg.*
C holmesiana *Ashe*
C. macauleyae *Sarg.*
C. maineana *Sarg.*
C. matura *Sarg.*
C. ornata *Sarg.*
C. opulens *Sarg.*
C. parviflora *Sarg.*
C. pastorum *Sarg.*
C. pedicellata *Sarg*
C. persimilis *Sarg.*
C. pringlei *Sarg.*
C. rubicunda *Sarg.*
C. spissiflora *Sarg.*
C. streeterae *Sarg.*
C. succulenta *Lk.*
C. tenuiloba *Sarg.*
C. thayeri *Sarg.*
C. verecunda *Sarg.*

E. B. Sterling, Trenton N. J.

Cyclomyces greenei *Berk.*
Lactarius corrugis *Pk.*

F. C. Stewart, Geneva

Coleosporium senecionis (*Pers.*) *Fr.*
Fusarium aquaeductuum *R. & R.*

D. R. Sumstine, Kittanning Pa.

Grifola sumstinei *Murrill*
Hydnum earleanum *Sumst.*
Pholiota luteofolia *Pk.*
Pleurotus umbonatus *Pk.*

C. Thom, Storrs Ct.

Craterellus taxophilus *Thom*

C. Thal, Milwaukee Wis.

Cortinarius heliotropicus *Pk.*

H. L. Ward, Milwaukee Wis.

Lepiota acutesquamosa *Weinm.*

J. E. Weaver, Rochester

Lentinus lepideus *Fr.*

D. O. Wickham, Hotel Champlain

Clavaria pistillaris *L.*
Clitocybe multiceps *Pk.*
Geaster minimus *Schw.*

D. B. Young, Albany

Morchella deliciosa *Fr.*

SPECIES NOT BEFORE REPORTED

Amanita crenulata Pk.

Among fallen leaves in woods. Port Jefferson. August. In our specimens the pileus is more yellow and its margin more distinctly striate than in the type specimens. The mealiness at the top of the stem and the flocculent edge of the lamellae in some of the specimens are also yellowish.

Amanita lignophila Atk. ined.

Decaying wood in woods beyond Forest Home near Ithaca. G F Atkinson. A rare species similar in size and shape to Amanita mappa but separable from it by the grayish brown color of the pileus, the solid stem and the thicker membrane of its volva. The spores are globose, granular within and .0003–.0004 of an inch in diameter.

Amanita radicata Pk.

Sandy soil in woods and open places. Port Jefferson, Suffolk co. August. In our specimens the warts of the pileus are smaller than in the typical form.

Arenaria leptoclados Guss.

Wet rocky places near Little Falls. October. J. V. Haberer. This is A. serpyllifolia var. tenuior Koch of *Synoptical Flora of North America*, fasc. 2 p. 239. Introduced.

Arisaema stewardsoni Britton

Moist rich soil in woods. Lake Bonaparte. June. Similar to A. triphyllum in size and general appearance, but easily separated from it by the white spadix and spathe. Forms having a pale but striped spathe sometimes occur and appear to be intermediate between the two species.

Boletus atkinsoni n. sp.

PLATE R, FIG. 1-5

Pileus fleshy, convex or nearly plane, dry, grayish brown or yellowish brown, sometimes minutely rimosely squamulose, flesh white, taste mild; tubes convex, plane or slightly concave in the mass, adnate or slightly depressed around the stem, 3-4 lines long, the mouths minute, at first whitish and stuffed, soon open and yellow or subochraceous; stem stout, equal or slightly thickened at one or both ends, solid, reticulated wholly or at the top only with fine anastomosing brownish lines, pallid; spores fusiform or oblong, .0004-.0005 of an inch long, .00016–.0002 broad.

Pileus 3-4 inches broad; stem 2-4 inches long, 6-12 lines thick.

Woods. Port Jefferson. August. The species belongs to the section Edules. The reticulations of the stem are so delicate that they sometimes nearly disappear in drying.

Boletus laricinus Berk.

Under larch trees, Larix decidua Mill. Washington park, Albany. October. C. H. Prescott. Edible.

Boletus nobilis n. sp.

Woods. Port Jefferson. August. Edible. For description of the species see article on edible fungi.

Boletus rugosiceps n. sp.

PLATE Q, FIG. 6-10

Pileus firm, fleshy, very convex or hemispheric, becoming broadly convex, dry, rugosely pitted, ochraceous, sometimes tinged with red or orange, occasionally rimose areolate, the thin margin often extending slightly beyond the tubes, flesh white or whitish; tubes at first closed, depressed around the stem, their mouths yellow, becoming darker with age, minute, round; stem firm, subequal, solid, with elevated longitudinal lines or ridges, dotted with numerous brownish or yellowish points, pallid, often narrowed at the base; spores oblong fusiform, .0006-.0008 of an inch long, .0002-.00024 broad.

Pileus 1-3 inches broad; stem 3-4 inches long, 6-8 lines thick.

Woods. Port Jefferson. August. This species grows with B. rubropunctus, from which it is easily separated by its dry pileus, smaller tubes and stouter stem. This is large in proproportion to the size of the pileus. In both the scabrously dotted stem is suggestive of Boletus scaber, but both are separable from that species by the yellow color of the tubes and the different dots of the stem.

Botrychium tenebrosum A. A. Eaton

Deerfield, Oneida co. July. J. V. Haberer. This is one of the smallest of the grape ferns.

Bryum pendulum Schp.

Clayville, Oneida co. B. D. Gilbert.

Cladonia verticillata Hoffm.

Adirondack mountains. Formerly considered a variety of C. gracilis, but now deemed worthy of specific distinction.

Clavaria botrytoides n. sp.

Ground in woods. Port Jefferson. August. Edible. For description of the species see the article on edible fungi.

Clavaria xanthosperma n. sp.

Stem very short, firm, solid, divided into numerous branches, white, sometimes becoming red where wounded, ultimate branches short, blunt or obtusely dentate at the apex, the axils rounded, the whole plant white, becoming yellowish or cream-colored with age; spores pale yellow, oblong, .0005-.0006 of an inch long, .00016-.0002 broad, slightly and obliquely pointed at one end.

Woods. Smithtown, Suffolk co. August.

It forms tufts about 2 inches high.

Collybia amabilipes Pk.

Dead trunks. Near Ithaca. June. G. F. Atkinson. Readily distinguished by its tawny, velvety stem.

Convolvulus repens L.

Shushan, Washington co. August. F. Dobbin. This species may be distinguished from C. spithamaeus by its long trailing or twining stems and by the rounded basal lobes of its leaves.

Cortinarius heliotropicus n. sp.

PLATE P, FIG. 1-7

Pileus thin, broadly campanulate, convex or nearly plane, fibrillose, viscid, heliotrope purple, generally spotted or variegated by yellowish white spots, flesh whitish, taste mild or slightly and tardily acrid, odor slight, resembling that of radishes; lamellae narrow, thin, close, rounded behind, adnexed, concolorous with the pileus when young, cinnamon when mature; stem firm, solid, or spongy within, usually slightly thickened at the base, silky fibrillose, viscid, whitish, spotted with purple or colored like the pileus, white within, spores elliptic, .0004-.0005 of an inch long, .0002-.00024 broad.

Pileus 1-2.5 inches broad; stem 1.5-3 inches long, 2-4 lines thick.

Woods. Smithtown. August. This is one of the most beautiful species of Cortinarius. It belongs to the section Myxacium.

In some specimens the spots on the pileus are large or confluent, in others they are almost or entirely absent, but usually they are small and distinct. The purple color of the lamellae is persistent for some time. In large specimens the margin is sometimes adorned by fibrillose scales of the veil.

Craterellus taxophilus Thom

Decaying vegetable matter under branches of ground hemlock, Taxus canadensis. Ithaca. October. C. Thom.

Crataegus persimilis Sarg.

Near Eastern avenue continued, Rochester. This species is allied to C. crus-galli from which it may be separated by its smaller flowers, more numerous stamens, more highly colored fruit and more conspicuously glandular serrate calyx lobes.

Crataegus beata Sarg.

Near the roundhouse of the Pennsylvania Railroad, Rochester. Also reported from several other places in and near Rochester. The 20 stamens with dark maroon colored anthers constitute a peculiar character of this species. It and the seven following species belong to the section Pruinosae. In all of them the fully grown but unripe fruit is more or less pruinose.

Crataegus lennoniana Sarg.

Seneca park, Rochester. Reported from Adams Basin, Monroe co., and Murray, Orleans co., by M. S. Baxter and from Buffalo by

J. Dunbar. In this and the preceding species the flowers have 20 stamens with red anthers and the fruit is longer than broad.

Crataegus leiophylla Sarg.

Seneca park, Rochester. This thorn takes its specific name from the smoothness of its leaves. Its flowers have 20 stamens but the anthers are pale yellow. Its fruit remains green and pruinose late in the season, ripening in November.

Crataegus formosa Sarg.

Seneca park, Rochester. It has been reported from Buffalo by Mr Dunbar. Its stamens are 20 and the anthers pale yellow. Its fruit also is longer than broad. The tips of the calyx lobes are often deciduous from the ripe fruit.

Crataegus compta Sarg.

Seneca park and Genesee Valley park, Rochester. It has also been found at Rush, Monroe co. and Avon, Livingston co. by Mr Baxter and at Buffalo by Mr Dunbar. Its stamens are 10 and the fruit is generally longer than broad, and is often somewhat pointed at the base. It is peculiar in having a bitter taste. The mature leaves are dark bluish green on the upper surface.

Crataegus diffusa Sarg.

Seneca park, Rochester. Niagara Falls. C. S. Sargent. A shrub with numerous stems and widespreading branches. Its 10 stamens with purple anthers constitute one of its peculiar features. On vigorous young shoots the leaves are sometimes as broad as they are long and they have petioles shorter than those of the leaves on lateral or fertile branches. The fruit is similar in size and shape to that of C. c o m p t a.

Crataegus opulens Sarg.

Eastern bank of the Genesee river in the northern part of Rochester. The opulent thorn is a rare but well marked species. In the leaves of young and vigorous shoots the basal pair of lobes is enlarged and distinctly separated from the pair above by deep clefts in the margins of the leaf. This gives a three lobed appearance to the leaf. Sometimes the basal lobes are themselves slightly lobed. The fruit is either globose or depressed globose.

Crataegus maineana Sarg.

West side of Seneca park, Rochester. Near Portage, Livingston co. Also found at Adams Basin by Mr Baxter and at Buffalo by

Mr Dunbar. The late ripening globose fruit and the bronze red autumnal foliage are noticeable characters of this species. It has 10 stamens with purple anthers as in C. diffusa, but in its almost deltoid or triangular leaves and its nearly entire calyx lobes it is quite distinct from it.

Crataegus baxteri Sarg.

Seneca park, Rochester. It has also been found at Honeoye lake by Mr Baxter and at Chapinville, Ontario co. by Professor Sargent. It and the next following species belong to the section Intricatae.

Crataegus verecunda Sarg.

Seneca park, Rochester. This is at present the only known locality of this very rare thorn. It is a smaller shrub than the Baxter thorn and its smaller fruit is longer than broad. The fruit of C. baxteri is nearly or quite globose and ripens later.

Crataegus fulleriana Sarg.

In the northern part of Rochester on the east bank of Genesee river. It has been found at Rush and Rochester Junction, Monroe co., by Messrs Baxter and Dunbar. This and the two following species belong to the section Molles. The Fuller thorn is a fine and an attractive species. Its flowers have 20 stamens and its large scarlet hairy but shining fruit is longer than broad. It may be either rounded or pointed at the base and is crowned by the long, very narrow and persistent calyx lobes which constitute a peculiar feature of the species.

Crataegus ellwangeriana Sarg.

Rochester and near Portage, Livingston co. The Ellwanger thorn becomes a tree of considerable size. It differs from the Fuller thorn in having only 8-10 stamens in its flowers, in its shorter, stouter spines, shorter pedicels and broader calyx lobes.

Crataegus spissiflora Sarg.

Genesee Valley park, Rochester. Between North Albany and Menands, east of Troy road. The peculiar character of this species and one suggestive of the specific name is its small compact clusters of flowers. Much of the hairiness of its inflorescence and early foliage disappears with age. Its fruit is generally a little longer than broad. It is glabrous when ripe and of a bright scarlet color, beautiful to behold.

Crataegus durobrivensis Sarg.

Banks of the Genesee river in the northern part of Rochester. Near North Albany. It has also been found at Niagara Falls by C. S. Sargent and at Buffalo by J. Dunbar. The Rochester thorn has flowers with 20 stamens, rose-red anthers and 4-5 styles. The calyx lobes are slightly hairy inside, the fruit is globose or nearly so and is said to persist on the branches till midwinter. The species has been placed by Professor Sargent in the section Dilatatae, though somewhat aberrant in its characters. In our synopsis of the species we have placed it temporarily in the section Lobulatae, from which it diverges in its more numerous stamens.

Crataegus acclivis Sarg.

Steep banks of the Genesee river in the northern part of Rochester. It has also been found at Rush by M. S. Baxter and at Niagara Falls by C. S. Sargent. It is a large fine species easily recognized by its nearly erect branches and its large bright red fruit which is generally a little longer than broad. It sometimes retains, when ripe, some of the hairiness which is so noticeable on the calyx at flowering time. A peculiar feature of the species consists of the broad, lunate, coarsely serrate and persistent stipules which are found on young and vigorous shoots. The lowest pair of lobes on some of the large leaves of these shoots is larger than the others. The flowers have 5-7 stamens with pink anthers. This and the next following species belong to the section Lobulatae.

Crataegus pedicellata Sarg.

Rochester. The pedicellate thorn is a large, handsome and attractive species scarcely less beautiful in fruit than in flower. The fruit is either oblong or pyriform and of a bright scarlet color. It is crowned by the generally persistent, erect or incurved, glandular serrate calyx lobes. Its 10 stamens have rose-red anthers.

The 10 following species belong to the section Tenuifoliae.

Crataegus parviflora Sarg.

Seneca park, Rochester. It has also been found at Rush by M. S. Baxter. It may be recognized when in bloom by its loose clusters of small flowers supported on long, branched, slender peduncles. The stamens are 5-6, the anthers pink and the styles 2-3.

Crataegus streeterae Sarg.

Genesee Valley park, Rochester. A peculiar feature of this species is the long acuminate point of its leaves. The blades of

some of the leaves of vigorous young shoots are more or less wrinkled. The stamens are 7-10, the anthers rose-red and the styles 3-4.

Crataegus glaucophylla Sarg.

Seneca park and Genesee Valley park, Rochester. Westport, Essex co. In the typical form of this species the leaves at flowering time have a glaucous bloom on the upper surface and are pale and glaucous beneath. This glaucous bloom is sometimes wanting. The stamens vary from 5-10 and the anthers are rosy red. On vigorous shoots the leaves are sometimes slightly cordate. The fruit is longer than broad, bright red or scarlet and sometimes hangs on the branches long after the leaves have fallen.

Crataegus ornata Sarg.

Genesee Valley park, Rochester. Found also at La Salle, Niagara co., by J. Dunbar. On fertile branches the leaves are often oblong ovate but on vigorous young shoots they are broadly ovate. The stamens are 10, the anthers rose-red and the styles 2-3. The fruit hangs in drooping clusters, is of a bright scarlet color and quite ornamental.

Crataegus rubicunda Sarg.

Genesee Valley park, Rochester. It has been found at Buffalo by J. Dunbar. It closely resembles the preceding species, from which it differs in the slight hairiness of the calyx and pedicels, in the red flesh of the fruit and in the yellowish green color of the foliage.

Crataegus tenuiloba Sarg.

River bank south of Rochester. The thin lobed thorn has ovate or broadly ovate leaves and is similar in its general characters to the two preceding species but it differs from them in having smaller, fewer flowered clusters and in its bright scarlet fruit which is gradually narrowed toward the base.

Crataegus colorata Sarg

Genesee Valley park, Rochester. It has also been found at Murray, Orleans co. by M. S. Baxter and at Buffalo by J. Dunbar. It differs from the five preceding species in having its ripe fruit crimson instead of scarlet. Its stamens are 10, anthers rose-red and styles 3-4. Its branches bear numerous spines which are slender or stout, straight or curved.

Crataegus beckwithae Sarg.

Genesee Valley park, west side of the river, Rochester. The Beckwith thorn differs from all the preceding species of this section in its globose fruit, It is sometimes full and rounded at the base and sometimes pointed. It is dark crimson when ripe and its flesh is tinged with red. The calyx lobes at flowering time are marked on the inside toward the tips with minute white dots. This peculiar character is present in all our flowering specimens. The leaves are broadly ovate or almost triangular. On vigorous young shoots some of them are slightly cordate.

Crataegus dunbari Sarg.

East bank of the Genesee river in the northern part of Rochester. It has also been found at Adams Basin by M. S. Baxter and in Delaware park, Buffalo by J. Dunbar. The Dunbar thorn differs decidedly from all the preceding species of this section in its leaves which are oval or suborbicular and become much thicker and firmer with age. The fruit is globose or subglobose and crimson when ripe. The stamens are 10, anthers red, styles 3-4.

Crataegus benigna Sarg.

Genesee Valley park, Rochester. The benignant thorn is unlike any of the previously recorded species of this section in having 15-20 stamens. The anthers are red and the fruit, which is longer than broad, is scarlet. The leaves are often truncate or slightly cordate at the base, specially on leading vigorous shoots.

Crataegus cupulifera Sarg.

Seneca park, west side, Rochester. It has also been found at Rush and Honeoye lake by M. S. Baxter, and at Buffalo by J. Dunbar. The cup-bearing thorn has the flowers cup-shaped. The stamens are 10, the anthers pink, the styles 3-4 and the calyx lobes hairy inside. The fruit is globose or nearly so and is scarlet when ripe.

Crataegus macauleyae Sarg.

Genesee Valley park, Rochester. The Macauley thorn may readily be distinguished from the preceding one by its 20 stamens with pale yellow anthers. It has 4-5 styles and its ripe fruit is crimson and has a more prominent calyx rim. The fruit in both is nearly alike in size and shape. Both species belong to the section Coccineae.

Crataegus gemmosa Sarg.

Genesee Valley park, Rochester. In this species the leaves are oval or occasionally rhomboidal or obovate. The stamens are 20,

anthers rose-red and styles 2-3. The ripe fruit is scarlet, a little longer than broad and crowned with a calyx rim. The calyx lobes are hairy inside, reflexed and fringed on the margin with long stipitate glands.

Crataegus deweyana Sarg.

Hagaman swamp near Rochester. It has also been found at Rush by M. S. Baxter. In the Dewey thorn the leaves are ovate or broadly ovate and sharp pointed or acuminate. The stamens are 7-10, the anthers dark rose-red and the styles 2-3. The ripe fruit is scarlet, globose or subglobose and destitute of a calyx rim. The calyx lobes are not strongly or conspicuously glandular serrate.

Crataegus ferentaria Sarg.

Near the roundhouse of the Pennsylvania Railroad, Rochester. The light armed thorn has oval or rhomboidal leaves acute at the apex and rounded or broadly cuneate at the base. The petioles are generally less than half an inch long and they often become red toward the end of the season. The stamens are 10, anthers pale yellow, styles two and calyx lobes distinctly glandular serrate. The ripe fruit is crimson, globose or subglobose and destitute of a prominent calyx rim. The ventral cavities of the nutlets are deep and sometimes crowd upon or cut through the lateral walls.

Crataegus laneyi Sarg.

Genesee Valley park, Rochester. The Laney thorn may be distinguished from the three preceding species by its having 10-15 stamens, pale yellow anthers, 2-4 styles and a villose inflorescence. It and the other three species mentioned belong to the section Tomentosae.

Crataegus tatnalliana Sarg.

North and west of North Albany. In this plant the fruit is globose or oval, and the leaves are often more or less twisted or contorted on the margin, as if there was an excessive development of tissue in that part of the blade. In the leaves of C. p r i n g l e i the reverse condition appears to prevail. The margin of the leaf is decurved, apparently because of a deficient development of the marginal tissue or an excessive development of the central portion of the leaf. This makes the leaf convex above, concave beneath.

Crataegus hudsonica Sarg.

Tivoli hollow between Albany and West Albany. This species is closely related to C. s u b o r b i c u l a t a Sarg. and like that species it has suborbicular leaves. It differs from it in having the

leaf lobes more sharp pointed, in having fewer styles and nutlets and in its globose mostly drooping and uniformly red fruit. Its styles and nutlets are generally 3. Its flowers open about May 20 and its fruit is ripe about the middle of October.

Of the 35 species of Crataegus here recorded, specimens of 33 were collected in and near Rochester. In order to indicate more clearly the distinguishing features of the Rochester species, some of which resemble each other very closely, the following synoptic tables of the sections and species have been prepared. The table of the sections is intended to include only the Rochester species. A few species found in and about Rochester but not recorded in the preceding pages, they having been previously reported, have been included in the table of species. They are Crataegus crus-galli, C. punctata, C. pringlei, C. holmesiana, C. matura, C. macracantha, C. succulenta and C. tomentosa.

Synopsis of the sections

Nutlets with the ventral faces excavated.....Tomentosae
Nutlets with the ventral faces not excavated..... 1
1 Leaves gradually narrowed to a short petiole..... 2
1 Leaves not having this character..... 3
2 Upper surface of the leaves shining..... Crus-galli
2 Upper surface of the leaves not shining.....Punctatae
3 Fruit large, more than 6 lines long..... 4
3 Fruit medium or small, 6 lines long or less..... 5
4 Flower clusters hairy, ripe fruit more or less hairy except in C. spissiflora.....Molles
4 Flower clusters hairy or glabrous, ripe fruit glabrous except in C. acclivis.....Lobulatae
5 Fruit distinctly pruinose before ripening.....Pruinosae
5 Fruit not distinctly pruinose before ripening..... 6
6 Leaves thin, glabrous except when young.....Tenuifoliae
6 Leaves becoming thick or subcoriaceous with age..... 7
7 Fruit falling while yet hard.....Intricatae
7 Fruit becoming soft before falling.....Coccineae

Synopsis of the species

CRUS-GALLI

Stamens 10 — C. crus-galli
Stamens 10–20 — C. persimilis

PUNCTATAE

Stamens 20 — C. punctata

MOLLES

Stamens 15–20 — C. fulleriana
Stamens 8–10 — 1
1 Ripe fruit hairy — 2
1 Ripe fruit glabrous — C. spissiflora
2 Some of the mature leaves convex — C. pringlei
2 None of the mature leaves convex — C. ellwangeriana

LOBULATAE

Stamens 20 — C. durobrivensis
Stamens 10 — C. pedicellata
Stamens 5–8 — 3
3 Fruit hairy — C. acclivis
3 Fruit glabrous — C. holmesiana

PRUINOSAE

Stamens 15–20, anthers red or maroon — 4
Stamens 15–20, anthers pale yellow or whitish — 5
Stamens 7–10 — 6
4 Anthers dark maroon color — C. beata
4 Anthers red — C. lennoniana
5 Fruit ripe in November, calyx rim prominent — C. leiophylla
5 Fruit ripe in October, calyx rim absent — C. formosa
6 Fruit longer than broad — 7
6 Fruit not longer than broad — 8
7 Fruit bitter, anthers red — C. compta
7 Fruit sweet, anthers purple — C. diffusa
8 Leaves on vigorous shoots often trilobed, anthers red — C. opulens
8 Leaves on vigorous shoots not trilobed, anthers purple — C. maineana

INTRICATAE

Fruit subglobose, 6 lines long — C. baxteri
Fruit oblong or obovate, 4–5 lines long — C. verecunda

TENUIFOLIAE

Fruit longer than broad — 9
Fruit not longer than broad — 14
9 Stamens 5–6, anthers pink, fruit crimson — C. parviflora
9 Stamens 7-10, anthers red, fruit scarlet — C. streeterae
9 Stamens 7-10, anthers purple, fruit scarlet — C. glaucophylla
9 Stamens 10 — 10
9 Stamens 15-20 — C. benigna

10 Fruit narrowed toward the base, obconic C. tenuiloba
10 Fruit not obconic 11
11 Ripe fruit scarlet 12
11 Ripe fruit crimson 13
12 Pedicels and calyx glabrous C. ornata
12 Pedicels and calyx slightly hairy C. rubicunda
13 Fruit ripe in August C. matura
13 Fruit ripe in September C. colorata
14 Leaves triangular ovate, styles 5 C. beckwithae
14 Leaves oval or suborbicular C. dunbari

COCCINEAE

Stamens 10, anthers pink, fruit scarlet C. cupulifera
Stamens 20, anthers pale yellow, fruit crimson C. macauleyae

TOMENTOSAE

Stamens 20, anthers red 15
Stamens 10, anthers pale yellow 16
Stamens 7-10, anthers red C. deweyana
Stamens 10-15, anthers pale yellow C. laneyi
15 Leaves ovate or ovate oblong C. tomentosa
15 Leaves elliptic C. succulenta
15 Leaves orbicular C. gemmosa
16 Fruit drooping, spines 1.5-2.5 inches long C. ferentaria
16 Fruit erect, spines 2.5-4 inches long C. macracantha

Dipsacus laciniatus L.

Near Beaver park, Albany. August. This is a recently introduced species but it appears to be well established here but being within the city limits it may not persist many years. It may be distinguished from the common teasel, D. sylvestris, by its laciniate or pinnatifid leaves. Its flowers are paler than in that species.

Eocronartium typhuloides Atk.

Living moss, Anomodon attenuatus. Cascadilla woods near Ithaca. July. G. F. Atkinson.

Falcata pitcheri (T. & G.) Kuntze

North Greenbush and West Albany. This species is not very unlike F. comosa, (Amphicarpaea monoica of the older botanies) with which it was formerly united. It is chiefly distinguished by its larger leaves and the tawny villosity of its stem.

Fusarium aquaeductuum R. & R.

Refrigerator drains. Geneva. September. F. C. Stewart. Our specimens of the "refrigerator fungus" were taken from the drain-pipe of a house refrigerator. The fungus sometimes multiplies till it chokes the drain and stops the outflow of the water.

Galera capillaripes Pk.

North Elba, Essex co. August. This little mushroom resembles Galera tenera in color, but it is much smaller and has a very slender, almost filiform stem, more narrow and distant lamellae and smaller spores.

Geranium bicknellii Britton

Ledges and rocky places. Near Brownsville, Jefferson co. June. C. H. Peck. Little Falls. October. J. V. Haberer.

Gyrostachys ochroleuca Rydb.

Roadsides and pastures in rather dry soil. Lake Pleasant. August. C. H. Peck. Dry hillsides, near Ballston lake. S. H. Burnham. This species is closely allied to G. cernua.

Hexagona micropora Murrill

Dead branches. Verona, Oneida co., and South Bay, Madison co. July.

This species is closely related to and was formerly included in Hexagona alveolaris (DC.), which is equivalent to Favolus europaeus Fr. It may be separated from it, by its smoother pileus and smaller pores.

Hypholoma rugocephalum Atk.

Low moist ground. Port Jefferson. August. G. F. Atkinson. This species is at once recognizable by its brown rugose pileus.

Hypomyces banningiae Pk.

Parasitic on some mushroom which it transforms to such a degree as to render it unrecognizable. Pittsford, Monroe co. August. F. S. Boughton.

Hypomyces inaequalis Pk.

Parasitic on Amanita rubescens. Catskill mountains. F. H. Mickleborough. The parasite prevents the expansion of the pileus and whitens both stem and pileus. In the preceding species the spores have no septum, in this one they have a single septum near one end. They are therefore divided into two unequal parts and this suggests the specific name.

Lachnocladium semivestitum B. & C.

Low marshy places. Smithtown. August. G. F. Atkinson. This fungus might easily be mistaken for a species of Clavaria, but careful inspection shows that it is clothed toward the base by a minute downy white tomentum.

Lactarius brevis n. sp.

PLATE Q, FIG. 1-5

Pileus thin, broadly convex, plane or slightly depressed in the center, glabrous, azonate, whitish, sometimes with a slight alutaceous tinge, flesh white, milk whitish, quickly changing to sulfur yellow on exposure to the air, taste acrid; lamellae thin, narrow, crowded, adnate, whitish or pallid; stem short, equal or slightly tapering downward, solid or somewhat spongy within, glabrous, white; spores subglobose, .0003 of an inch long, .00025-.0003 broad.

Pileus 1-2 inches broad; stem about 1 inch long, 2-4 lines thick. This species is closely related to L. theiogalus from which it may be separated by its white or whitish color, its smaller size, solid or stuffed stem and the absence of tomentum from the base of the stem.

Lactarius colorascens n. sp.

Pileus thin, nearly plane, becoming centrally depressed, moist, glabrous, whitish or pallid when young, becoming brownish red with age, milk white, changing to sulfur-yellow on exposure to the air, taste bitter; lamellae thin, close, adnate or slightly decurrent, whitish, becoming yellowish with age; stem equal, solid, even, whitish, becoming brownish red with age; spores globose, rough, .0003 of an inch in diameter.

Pileus 1-2 inches broad; stem 1-1.5 inches long, 2-3 lines thick.

Woods. Port Jefferson. August. G. F. Atkinson. In the mature plant the color is similar to that of L. camphoratus, but the species is very distinct in the color of its milk and in its bitter taste.

Pholiota appendiculata n. sp.

PLATE P, FIG. 8-17

Pileus fleshy, firm, broadly convex or nearly plane, viscid when moist, shining, squamose with appressed spotlike scales, appendiculate on the margin with fragments of the veil, dark red when young, soon fading to pink and sometimes becoming yellowish brown or grayish brown, flesh at first purplish red, specially in the lower part, whitish or pale yellow when mature; lamellae thin,

close, rounded behind, adnexed or decurrent with a tooth, pale yellow or almost white, becoming brownish; stem short, firm, solid or with a small cavity, white above, brownish and squamose below the slight evanescent annulus, white within, the veil white, at first concealing the young lamellae, soon breaking into fragments and partly adhering to the margin of the pileus, partly to the stem.

Pileus 1-3 inches broad; stem about 1 inch long, 2-4 lines thick.

Decaying sawdust. McLean, Tompkins co. July. The annulus consists of a row of scales or fragments of the veil around the upper part of the stem, the greater part of the veil usually adhering to the margin of the pileus. The color of the spores prevents the reference of the species to the genus Hypholoma.

Salix serissima (Bail.) Fern.

North Elba and Lake Bonaparte. June. This willow has recently been separated from Salix lucida to which it was formerly joined as a variety. Its leaves are merely acute or short pointed at the apex, paler on the lower surface, very finely glandular serrate, the petioles have 1-3 pairs of glands at the top and the fertile aments are very late in ripening their capsules.

Scirpus occidentalis (Wats.) Chase

Oneida lake, Thompson lake and Lake Bonaparte. This bulrush was formerly considered a variety of Scirpus lacustris, but it has recently been published as a distinct species. It is distinguished from S. lacustris by its two cleft style, its smaller lenticular achene and its pubescent scales.

Sisyrinchium arenicola Bickn.

Sand barrens between Rossville and Kreischerville, Richmond co. May. S. H. Burnham.

Stachys sieboldi Miq.

Cinder dumps along the railroad north of Whitehall. September. S. H. Burnham. Introduced.

Teucrium boreale Bickn.

Low moist ground. South side of Oneida lake. J. V. Haberer.

Uredinopsis atkinsonii Magn.

Living fronds of the marsh shield fern, Dryopteris thelypteris. Near Ithaca. August. G. F. Atkinson.

Uredinopsis osmundae Magn.

Living or languishing fronds of cinnamon fern, Osmunda cinnamomea. Near Malloryville, Tompkins co. August. G. F. Atkinson.

Viola amoena LeConte

Wet places. Common in hilly and mountainous districts. In *Flora of the State of New York* this is united with V iola blanda, but as the tendency at the present time is toward the separation of closely related forms it seems best to restore this violet to its original specific rank.

Viola latiuscula Greene

Light gravelly soil. Minerva. This species was found in flower early in May. In our specimens the lower leaves have a slight purplish tinge.

Viola septentrionalis Greene

Borders of woods and grassy places. Warrensburg, Warren co., and Minerva, Essex co. The northern blue violet was found in flower the last week of May. Its lower leaves are small, reniform or suborbicular, its upper ones are bluntly pointed and its sepals are ciliate.

Xyris montana Ries

Borders of White lake, Forestport, Oneida co. July. J. V. Haberer. It also occurs in Cranberry marsh, Sandlake, Rensselaer co. It was formerly thought to be a variety of X. flexuosa, but it is now separated as a distinct species.

Zygodesmus granulosus Pk.

Decaying wood of poplar. East Schaghticoke. August.

REMARKS AND OBSERVATIONS

Agaricus abruptus Pk.

In his *Monograph I*, p. 348, Elias Fries described a mushroom under the name Agaricus abruptus. In *Hym. Eur.*, p. 245, he placed this species in his subgenus Flammula, still retaining for it the original name. In *Sylloge* the subgenus Flammula, with many other subgenera of Fries, was given generic rank and the name Agaricus abruptus was changed to Flammula abrupta, thus vacating the name Agaricus abruptus and leaving it available for some other application. But Rule 5 of what is known as the Rochester code forbids the use of such names, and though this rule may not be accepted in its present form by the coming international congress

of botanists, I have thought it best to change the name Agaricus abruptus Pk. and several other names given under similar conditions, so that they shall not conflict with this rule. I therefore substitute the name

Agaricus abruptibulbus for Agaricus abruptus Pk. N. Y. State Mus. Mem. 4, p. 163

Agaricus chlamydopus for Agaricus cothurnatus Pk. Torr. Bot. Club Bul. 31, p. 181

Agaricus halophilus for Agaricus maritimus Pk. Torr. Bot. Club Bul. 26, p. 66

Agaricus magniceps for Agaricus magnificus Pk. Torr. Bot. Club Bul. 26, p. 67

Agaricus micromegethus for Agaricus pusillus Pk. N. Y. State Mus. 54th An. Rep't, p. 152

Agaricus praerimosus for Agaricus tabularis Pk. Torr. Bot. Club Bul. 25, p. 325

Agaricus pilosporus for Agaricus sphaerosporus Pk. Torr. Bot. Club Bul. 31, p. 181

Agaricus cothurnatus Fr. is considered in *Sylloge* the equivalent of Stropharia cothurnata Fr. In like manner

Agaricus maritimus Fr. is Inocybe maritima Fr.

Agaricus magnificus Fr. is Amanita magnifica Fr.

Agaricus pusillus Pers. is Volvaria parvula Weinm.

Agaricus tabularis Pers. is Tricholoma grammopodium (Bull.)

Agaricus sphaerosporus Krombh. is Lepiota naucina Fr.

Antennaria canadensis Greene

Near North Albany. May. This species is common in the northern and eastern part of the State, but the staminate plants are rarely seen. I have found them only in the single locality here indicated.

Blephariglottis ciliaris (L.) Rydb.

Karner. July. This is Habenaria ciliaris R. Br. in Gray's *Manual*. It is a rare species in our State at the present time, but it is said to have been more common many years ago. In New York State Cabinet of Natural History, 18th Rep't, p. 136,

it is recorded as having been found on the Pine plains of Schenectady but in my numerous botanizing trips in this region it was not found till this year. It appears to have recently become established in the Karner locality, as it was found in a place frequently visited before. The plants were few and were growing among low shrubs in a rather dry place. The flowers are very beautiful.

Blephilia hirsuta (Pursh) Torr.

Low moist ground. East Schaghticoke. August. Rare.

Botrychium obliquum Muhl.

This grape fern is common in Oneida county, and is as variable as it is common. Dr Haberer has collected numerous specimens of it in the vicinity of Utica and has contributed to the herbarium a fine series of specimens representing all of our published varieties of it.

Cantharellus cinnabarinus Schw.

This small chantarelle was found in abundance near Port Jefferson in August. In one station several forms of it were growing in close proximity. In one form the whole plant had the usual cinnabar red color, but in some of the plants the stem was hollow. In another form the color of the pileus and stem was red as usual, but the lamellae were yellow. In a third form the cap was pale pink as if its normal color had faded. A fourth had pale pink lamellae and the margin of the pileus was strongly curved upward, making the pileus appear narrow and giving the whole plant a club shape. In a fifth form the whole plant was yellow. In all except the first the stem, so far as investigated, was hollow. But the most remarkable thing in the variations is the difference in the color of the spores. We are disposed to consider the color of the spores in any given species as one of its most constant and reliable characters. But in this case the plants with red or pink lamellae had spores that appeared pink in the mass, those with yellow lamellae shed yellow spores. Yet the spores were alike in size and shape, and we are obliged to conclude that all these forms belong to one species.

Carex castanea Wahl.

This rare sedge was credited to Essex county in the *Flora of the State of New York*, on the authority of Dr Kneiskern. In my own explorations in the county I had never met with it till the past season. It was found growing sparingly near Minerva. It is an early flowering species. It is C a r e x f l e x i l i s Rudge.

Carex formosa Dew.

This rare species was found in Seneca park, Rochester, on June 1. It was then in good condition for collecting.

Carex setifolia (Dew.) Britton

Limestone rocks, cliffs and precipices are generally given as the habitat of this pretty little sedge. But it is not limited to such places. Fine specimens of it were found in July growing in wet, mucky soil in woods about Bergen swamp. In more open wet places near it the rare Carex crawei Dew. was found.

Cercospora circumscissa Sacc.

This fungus was plentiful in the region about Lake Pleasant the past season. It attacks the living leaves of the chokecherry and the wild blackcherry. It kills the leaf tissues in small circular spots, and the dead tissues soon separate from the living and fall, leaving clean-cut circular perforations in the leaf.

Cypripedium reginae Walt.

A form of this showy species occurs in Bonaparte swamp in which the whole flower is white.

Eleocharis palustris vigens Bail.

This is a tall stout variety growing in shallow water. It was found growing in Oneida lake at Lakeport and specimens were collected. Variety glaucescens was found growing in low wet places at South Bay and in Bonaparte swamp. Judging from the external appearance alone it would be difficult to believe that these two plants are varieties of the same species.

Eriophorum alpinum L.

The alpine cotton grass is now plentiful in one place in Bonaparte swamp though it was not seen in my exploration of the swamp in 1899. It is also abundant in an old meadow near Elm lake in Hamilton county.

Fragaria americana (Porter) Britton

This strawberry is abundant in groves and the borders of woods at Lake Bonaparte. The flowers are scarcely more than 3 lines broad.

Gratiola aurea Muhl.

Fine specimens with slender weak stems a foot or more long were found growing in the marshy borders of a lake near Smithtown, Suffolk co.

Hieracium praealtum Vill.

This noxious weed has become very abundant in Lewis county. From Lyon Falls to Carthage it is plentiful along the railroad, in pastures and meadows and by roadsides. It is also common along the Carthage and Adirondack Railroad. It rivals buttercups and daisies in giving color to meadows infested by it. The orange hawkweed, H i e r a c i u m a u r a n t i a c u m, which is associated with it in some places and which is no less pestilential, was not seen here.

Hydnum adustum Schw.

An unusual form of this fungus was found in the western part of the State by G. E. Morris. The pileus is shaped like the bowl of a goblet by the upward curving of its margin and the stem is central. The whole plant is white.

Hygrophorus laurae decipiens n. var.

Pileus thin, stem slender, less than 6 lines thick, generally cespitose and attenuated at the base, pileus not changing color in drying, gills also nearly unchangeable. Edible. Near Elm lake, Hamilton county. September.

Hypholoma sublateritium (Schaeff.) Fr.

In October specimens of the brick-red hypholoma were sent to me with the statement that two persons who had eaten stewed mushrooms of this kind had been made sick by them. In one case "a severe headache with tingling and numbness in hands and arms and a feeling of general weakness and relaxation" developed in 15 hours after eating and lasted half an hour. In the other case the person "was attacked with violent nausea and purging." The difference in the symptoms of the two persons and the long time between the eating and the development of the symptoms led me to think that the mushrooms were not responsible for the sickness. It seemed to me that by some mistake the samples sent me were not the same kind as those that had been eaten or that the sickness was due to some other cause. As the samples sent me were still in fairly good condition, I concluded to try their edible quality myself. Three caps were selected, fried with butter and eaten. No harm and no unpleasant results followed, and my opinion of the innocence of the mushrooms was confirmed.

It is proper to add that in the typical form of the species the taste is said to be bitter, but in these specimens no bitter flavor was perceptible, though in other respects they exhibited the characters of the species.

Juniperus nanus Willd.

A large form of this juniper occurs at Lake Bonaparte. It forms circular patches as usual, but the branches are more erect and much taller. They are 6-8 feet tall and have a basal diameter of 2-4 inches. The leaves are 4-6 lines long and sometimes abruptly sharp pointed, sometimes gradually tapering into a subulate point. This form seems to make an approach toward Juniperus communis.

Limnorchis dilatata linearifolius Rydb.

Hidden lake, Herkimer county. J. V. Haberer. This variety may be distinguished from the typical form of the species by its more narrow linear leaves.

Marasmius resinosus niveus Pk.

As there is a Marasmius niveus Mont. a rigid observance of the rules of the Rochester code requires that this variety name should be changed. I therefore substitute for the name given in the report for 1902, p. 38, Marasmius resinosus candidissimus.

Osmunda claytoniana L.

This common fern sometimes grows in "fairy rings." Three examples of this kind of growth were seen at Lake Pleasant. In one there was a continuous line of fronds forming an ellipse of which the long diameter was about 3 feet. In another they formed about three fourths of the circumference of a circle, the line being interrupted in one place. In the third example the line was continuous and formed the circumference of a circle of which the diameter was about 2 feet. All the rings were near each other in a meadow.

Oxalis cymosa Small

This is a common species in the eastern part of the State. It is very variable, being glabrous or villose above and glabrous below or wholly villose. Its flowers are usually yellow, but sometimes they are very pale yellow or almost white. The color of the stem and leaves varies from yellowish green to purplish brown.

Phacelia dubia (L.) Small

Near Jamesville, Onondaga co. May. Mrs L. L. Goodrich. The specimens are in fine flowering condition. Specimens collected and sent by Mrs Goodrich in October 1903 were also in flower. The two sendings show that the plant may flower either in spring or in autumn.

Picea canadensis, (Mill.) B. S. P.

Lake Pleasant. June. The white spruce occurs sparingly in various parts of the Adirondack region. All of our spruces as well as the hemlock drop their leaves from the drying branches in consequence of which it is difficult to prepare satisfactory herbarium specimens. I have tried in various ways to overcome this difficulty and have inquired of many botanists both of this country and of Europe if they could tell me how to prepare specimens of these branches so that they might retain their leaves. Recently Mr William Richards gave me a recipe which was intended to meet this difficulty. It was taken to a druggist who prepared a sufficient quantity for trial. As soon as opportunity was given, specimens of suitable size both of the white spruce and the black spruce were taken and treated according to directions. The result has been quite satisfactory. The specimens have dried and retained their leaves to the present time. The color of the leaves is slightly affected, but the specimens are far more satisfactory than the bare twigs with leaves placed in packets by themselves. For the benefit of any who may wish to avail themselves of this method of preparing specimens of this kind a copy of the recipe is here given.

Recipe

For the treatment of fresh herbarium specimens of spruce and hemlock trees to prevent the leaves from falling from the twigs.

alum	500 gr.
salt	125 "
saltpeter	60 "
potash	300 "
white arsenic	100 "

Dissolve in 1 quart of water, cool and filter. To 1 quart of this solution add 4 quarts of glycerin and 1 quart of alcohol.

Immerse the fresh specimens in this mixture, letting them remain in it at least 48 hours. When taken out wash away any excess of mixture adhering to them with warm water.

After the external moisture has evaporated the specimens may be placed in drying papers and put in press in the usual way. When thoroughly dry they may be mounted on the herbarium sheets and placed in the herbarium.

Prunus americana Marsh.

This species of wild plum is common in the vicinity of Albany. It blossoms a little later than Prunus nigra. Its calyx lobes often terminate in two or three minute teeth.

Prunus pennsylvanica L. f.

A small tree of the wild red cherry was observed at Lake Bonaparte, the ripening fruit of which was white. Is it an albino?

Pterospora andromedea Nutt.

Port Henry. August. Miss H. A. Edwards. The contributed specimen is in fruiting condition, 35 inches long with a stem diameter of $\frac{5}{16}$ of an inch and bears more than 60 capsules. In *Flora of New York State* this species is credited to "various places in the vicinity of Albany," but it seems to have disappeared entirely from this locality. It is also credited to Port Henry, having been found there more than 60 years ago. It is gratifying to know that it still exists there.

Rosa sayi Schw.

Griswold's Mills, Washington co. July. S. H. Burnham. This rose also occurs in the vicinity of Westport.

Rudbeckia hirta L.

Two forms of this very common weed, both of which were new to the herbarium, were found by Miss C. S. Parsons in the western suburbs of the city.

Rudbeckia laciniata L.

This plant is subject to the attacks of a gall-producing insect. Specimens sent by Mrs Burnham from Washington county have from 1-3 globular green galls developed from the side or base of each head of flowers. In one example a branch 1.5 inches long had developed at a right angle to the stem just beneath the flower head. The branch itself bore a flower head.

Salix amygdaloides Anders.

A single tree of this species was found by Mr R. B. Hough at Lake Bonaparte. It is 25 or 30 feet tall, with a trunk diameter of about 8 inches. It extends the range of the species in our State farther north than before, but the species is known to occur still farther north in Canada. Its presence at Lake Bonaparte may be accidental, as only a single tree has yet been found there. To the six species of willow previously found in Bonaparte swamp, Salix cordata and Salix nigra should be added, making eight species in all.

Sarracenia purpurea L.

Two specimens of the pitcher plant were found growing on the margin of the roadbed of the railroad that runs through Bona-

parte swamp. This roadbed is a sandy gravel of which a component part is decomposed crystalline limestone, which is abundant in that vicinity. The plants were only a few inches above the general level of the swamp. Both were in flower, but the flowers were very abnormal. Instead of the usual sepals, petals and stamens, there were numerous oblong or spatulate petaloid organs, green on the inner surface and more or less tinged with reddish brown on the outer. In one there were about 30, in the other about 45 of these pseudopetals. The ovary was imperfectly developed and the usual peltate stigmatic disk was transformed into erect irregular folded or crumpled leaflike lobes. The whole flower was suggestive of a "double blossom" of greenish petals. The unnatural habitat of limestone gravel and sand was the only apparent cause of the transformation. Other plants with flowers of the usual kind were growing near these, but in the soft wet soil of the swamp.

Silene vulgaris (Moench) Garcke

Machias, Cattaraugus co. July. F. E. Fenno. This is a peculiar form having few flowered simple stems and narrowly elliptic or ovate leaves.

Stereum spadiceum Fr.

A form of this species was found near Port Jefferson in which the pilei were crispate complicate as in Stereum complicatum.

Vagnera stellata (L.) Morong

The fruit of the star-flowered Solomon's seal is described in our botanies as sometimes black, and sometimes green with six black stripes. A form was found in Bergen swamp the fruit of which was green with three black stripes.

Viburnum lentago L.

The leaves of this species are described as ovate. A form was found near Delanson, Schenectady co. of which the leaves vary from very broadly ovate to nearly orbicular. Another form was found on Crown Point of which the leaves are oblong and pointed at each end. Its fruit is destitute of bloom and ripens earlier than in the typical form. This may prove worthy of varietal distinction.

Viola palmata dilatata Ell.

Wooded hillside near Saugerties. May. In these specimens some leaves have the broad central lobe, others are not lobed at all. It seems to be intermediate between the variety and an entire leaved form.

Viola papilionacea domestica (Bickn.) Poll.

Streets and waste places of Port Jefferson. August. This so called variety is so unlike the typical form of the species that to most minds it would be far more satisfactory to consider it a distinct species unless there are connecting forms.

EDIBLE FUNGI

Lepiota cepaestipes Sow.

ONION-STEMMED LEPIOTA

PLATE 87, FIG. 1–5

Pileus thin, fleshy in the center, ovate or obtusely conic, becoming campanulate or expanded, broadly umbonate, soon squamulose except in the center, dry, plicate striate on the thin margin, white, the umbo and squamules brownish, flesh white, taste mild; lamellae thin, narrow, close, free, white; stem slender, enlarged toward the base, slightly mealy pruinose or glabrous, stuffed or hollow, white, the slight annulus sometimes evanescent; spores white, .0003–. 0004 of an inch long, .0002–.0003 broad.

The onion-stemmed lepiota takes its name from the peculiar shape of the lower part of the stem. There is an enlargement below the middle which gives the stem a shape similar to that of the flowering stem of an onion. The flesh of the cap is thin except in the center where it is thickened into a prominence or umbo. On the margin it is very thin and marked by closely placed radiating furrows or striations with narrow ridges or folds between them. The surface of the cap is covered by a dense flocculent coat or veil which soon breaks into minute scales or points and with the expansion of the cap they give it a roughened or dotted appearance. The veil however remains entire on the umbo and gives it a brownish color. The cap is dry, flexible and slightly tough. The gills are closely placed side by side and do not reach the stem. They are minutely floccose on the edge and white while young and fresh, but they assume a brownish hue with age or in drying, similar to that assumed by the gills of the smooth lepiota, L. naucinoides, under the same conditions.

The stem is rather long and except in the enlarged part is scarcely thicker than the stem of an ordinary tobacco pipe. Occasionally the enlargement is absent and the diameter of the stem is about the same from top to bottom. In the young plant it is stuffed with a webby pith, but usually it becomes hollow with age. The surface is covered with a slight mealiness but this may disappear when the plant is old. It is white or whitish. This mushroom generally

grows in tufts or close clusters in rich soil, tan bark, sawdust or decomposing vegetable matter. It is perhaps found quite as often in greenhouses or conservatories as in the open air. Our specimens were found growing in a bed of decaying sawdust in the open air. The heat generated by the decaying sawdust was doubtless very acceptable to it. A yellow form of the species is said to occur but I have not met with it in my explorations. In my trial of its edible qualities it seemed to me to have an excellent flavor but a slightly tough texture. According to one author "the entire fungus is tender and delicious cooked in any way."

Hygrophorus nitidus B. & C.

SHINING HYGROPHORUS

PLATE 88, FIG. 1–7

Pileus thin, fragile, convex, umbilicate, viscose, pale yellow, shining, and striatulate on the margin when moist, whitish when dry; lamellae arcuate, distant, decurrent, pale yellow; stem slender, viscose, hollow, colored like the pileus; spores broadly elliptic or subglobose, .00025–.0003 of an inch long, .0002-.00025 broad.

The shining hygrophorus is a small species of a beautiful yellow color throughout. Both cap and stem are very viscid and both are fragile. The cap has a conspicuous central depression or umbilicus. When moist, obscure radiating lines may be seen on the margin. These are merely the shadowy appearance of the gills beneath and are due to the thin translucent character of the margin. As the moisture escapes from the cap it becomes whitish and the shadowy lines disappear. The gills are wide apart and their inner end is gradually narrowed and extends downward on the stem. In dried specimens the interspaces are usually wrinkled or venose, specially in large specimens. The stem is rather long in proportion to the size of the cap. It is so viscid and fragile that it is difficult to pull a specimen from the ground without breaking it. In some cases the stem is gradually thickened as it enters the cap. It and the gills usually retain their color longer than the cap.

The cap is rarely more than 1 inch broad; the stem is 1.5-3 inches long and 1-2 lines thick. The species is generally gregarious in its mode of growth, but sometimes it is cespitose. It grows in moist soil full of humus in swamps or low damp places. As an edible mushroom it is not very important because of its small size, but it is tender and agreeable in flavor and may sometimes be convenient to add to a scanty supply of larger species. It is found in July and August.

Hygrophorus laurae decipiens Pk.

DECEIVING HYGROPHORUS

PLATE 88, FIG. 8-11

Pileus thin except in the center, broadly conic with involute margin when young, becoming convex or nearly plane, glutinose, white with a dingy yellow or smoky brown spot in the center, flesh white, taste mild; lamellae subdistant, adnate or decurrent, white; stem rather long, slender, viscid when moist, solid, attenuate at the base, white with white particles at the top; spores .00028-.0003 of an inch long, .00016-.0002 broad.

The deceiving hygrophorus is most closely related to the laura hygrophorus, from which it can scarcely be separated in the fresh or living condition. The thinner flesh of the cap, the more slender stem more constantly narrowed and pointed at the base and its tufted mode of growth are the principal marks of distinction in the fresh plant. It is likely to be taken for a slender tufted form of the laura hygrophorus and the persistency of its colors in drying is the chief reason for considering it a variety of the species instead of a mere form. The cap is 1.5-3 inches broad; the stem 1.5-2 inches long, 3-5 lines thick. It grows in tufts among fallen leaves in woods or their borders, and may be found in September. Its edible character is similar to that of the laura hygrophorus.

Boletus laricinus Berk.

LARCH BOLETUS

PLATE 89, FIG. 1-7

Pileus fleshy, broadly convex or nearly plane, viscid when moist, sometimes squamose, dingy white or grayish white, flesh white; tubes short, adnate or slightly decurrent, whitish when young becoming darker and brown with age, their mouths large, angular, subcompound; stem short, solid, annulate, reticulate above the ring, grayish or brownish below; spores brown, oblong .0004-.0005 of an inch long, .00016-.0002 broad.

The larch boletus takes its name from its place of growth. It always grows under or near larchtrees. It is closely related to the Elba boletus, B. elbensis Pk., which is found under or near tamarack trees in the northern part of our State. In the larch boletus the cap is paler and has no pinkish brown tint which often is seen on the cap of the Elba boletus. Its cap is sometimes adorned by brown or blackish scales which are easily rubbed or washed away, leaving the whitish cap entirely naked. The flesh is soft and white or whitish. The tubes are at first whitish but they change

with age to brownish and then to a dark sepia color. The mouths are large and angular. In some cases shorter dissepiments within the larger tubes give them the appearance of being composed of two or more smaller ones. The tube walls extend downward on the stem to the ring and by anastomosing give the reticulated appearance called cribrose in the older descriptions. This is one of the distinguishing characters between the larch boletus and the Elba boletus. I have not yet tested the edible qualities of the latter, but the former is worthy of a place among our esculent species. It was collected in October.

Boletus rubropunctus Pk.

RED DOTTED BOLETUS

PLATE 90, FIG. 1-9

Pileus fleshy, very convex or broadly convex, glabrous, viscid and shining when moist, variable in color, pale red, crimson or bay red, flesh white; tubes plane or convex in the mass, depressed around the stem, their mouths small, round, pale yellow when young, becoming bright golden yellow; stem equal or slightly thickened toward the base, solid, punctate or minutely squamulose with red or pallid points, pallid or tinged with red; spores oblong fusiform, .0005-.0007 of an inch long, .0002-.00024 broad.

The red dotted boletus is a very variable species. The cap is strongly or slightly convex, smooth and shining, viscid when moist and covered with a thin tenacious pellicle which can be torn away like the skin from an overripe peach. In the young plant the thin margin sometimes extends a little beyond the mass of tubes. In color the cap may be pale red, bright red or crimson, reddish brown or chestnut color. The flesh is whitish, sometimes tinged with yellow. The tubes are plane or convex in the mass, depressed around the stem, pale yellow when young, becoming bright golden yellow with age. Their mouths are small and round. The stem is rather long and slender for the size of the cap, solid, equal in diameter in all its parts or sometimes slightly thicker at the base. It is marked with numerous small dots or points of a red, brownish or pallid color which at first sight suggests a similarity to the stem of a small specimen of Boletus scaber. The color of the stem may be whitish, pallid or reddish. The species is related to Boletus inflexus Pk. but it differs from it in having its tubes depressed about the stem, in its tube mouths being destitute of red granules and in its larger spores.

The cap is 1-2.5 inches broad; the stem is 1-3 inches long, 2-4 lines thick. It occurs in thin woods in July and August.

Boletus nobilis Pk. n. sp.

NOBLE BOLETUS

PLATE 91, FIG. 1-4

Pileus firm, convex, dry, glabrous, yellowish brown or reddish brown when young, becoming ochraceous or reddish ochraceous with age, flesh white, taste mild; tubes white and stuffed when young, becoming yellow or pale ochraceous with age, nearly plane in the mass, adnate or slightly depressed around the stem, the mouths small, round; stem equal or slightly thicker at the base, solid, glabrous, generally reticulated at the top, whitish or pallid; spores oblong fusiform, .0005-.0006 of an inch long, .0002-.00024 broad.

This large and fine species grows singly or in groups in thin woods and in cleared or bushy places. It belongs to the section Edules. It differs from the edible boletus, B. edulis in its tubes being less depressed around the stem and in having no green tint. From the related boletus, B. affinis, to which it is also closely allied, it is separated by its larger size, the paler color of the cap, the paler stem and its larger spores. The flesh is thin for the size of the cap and is yellowish next the tubes. The cap is 4-8 inches broad; the stem 3-6 inches long, 6-10 lines thick. It may be found in August. In preparing it for cooking the long tubes should be removed from the cap and be rejected with the stem.

Strobilomyces strobilaceus (Scop.) Berk.

CONELIKE BOLETUS

PLATE 92, FIG. 1-6

Pileus fleshy, firm, subglobose, hemispheric or convex, dry, covered with a dense thick coat of blackish or blackish brown tomentum which separates into prominent tufts or scales with intervening chinks or spaces of a pale gray or smoky white color, flesh whitish, changing to reddish on exposure to the air, then to blackish, tubes rather long, depressed around the stem, plane or convex in the mass, whitish when young and fresh, becoming red where wounded and then blackish, also becoming blackish or blackish brown with age; stem equal or tapering upward, solid, often sulcate at the top, covered with a tomentum similar to that of the pileus; spores blackish brown, globose or nearly so, rough, .0004-.0005 of an inch in diameter.

This boletus has such a peculiar shaggy appearance and blackish color and is so unlike any other mushroom in our flora that

it is scarcely possible to confuse it with any other. It grows in woods or their borders, generally only a few in place. The cap is usually 2-4 inches broad; the stem 2-5 inches long, 4-8 lines thick. It may be found from July to September. In preparing it for cooking use only the flesh of the caps, peeling away the tomentum from the upper surface and removing the somewhat tenacious tubes from the lower surface. It is harmless and though it may not be considered a first class mushroom for eating purposes, it is much better than none.

Clavaria botrytoides Pk. n. sp.

GRAPELIKE CLAVARIA

PLATE 93, FIG. 5-7

Stem small, short, divided near the base into branches which are repeatedly and irregularly branched, the ultimate branches short, crowded, blunt, usually terminating in two or more blunt teeth or protuberances, red or pink at the tips when young, soon fading and becoming concolorous, stem and branches solid, flesh white, taste mild; spores narrowly elliptic or oblong, rusty brown or subcinnamon, .0003-.0004 of an inch long, .00016-.0002 broad.

The grapelike clavaria is very closely related to the red tipped clavaria and probably has been confused with it. It may be separated from that species by its thinner stem, the fading or evanescent character of the color of the ultimate branchlets and by its shorter and differently colored spores. The tips of the branches in mature or old plants are whitish like the branches themselves, but often a few small branches may be found near the base of the plant which have red tips and are therefore presumably of later development. It is possible that these two clavarias have been confused in Europe for European mycologists do not agree in their description of the spore characters of the red tipped clavaria. Stevenson describes them as subhyaline, 12-15 μ long, 6 μ broad. Massee describes them as white, 8 μ long, 5 μ broad. In our plant the spores in mass have a rusty brownish or subcinnamon color when collected on white paper and they are 8-10 μ long, 4-5 μ broad.

The plants are 2-4 inches tall and 1.5-3 inches broad. They grow in thin woods on rather poor soil and may be found in August and September. The edible qualities seem to me to be similar to those of the red tipped clavaria.

Clavaria pistillaris L.

LARGE CLUB CLAVARIA

PLATE 93, FIG. 1-4

Club simple, large, soft, fleshy, glabrous, clavate or oblong clavate, obtuse, solid or slightly spongy within, even or nearly so, ochraceous buff, flesh white, taste mild; spores elliptic, .0004-.0005 of an inch long, .0002-.00024 broad.

The large club clavaria is not very common and is quite variable in size and shape. It is usually 2-6 inches long and 6-12 lines thick. Sometimes the club gradually enlarges from base to top, again it is swollen at the base and at the top or it may be nearly cylindric in the lower half and gradually enlarged upward in the upper half. Large thick specimens are sometimes cracked at the top, revealing the white flesh. The color is sometimes yellowish, sometimes ochraceous buff or tan color. It is often more highly colored at the top than toward the base. The plant is generally clean and free from the attacks of insects. It usually grows in a scattered manner, only a few specimens being found in a place, but occasionally it may form tufts of two or three plants. It grows in woods and may be found from August to September. The species is easily recognized and is not likely to be mistaken for any harmful mushroom. It is similar in its texture and flavor to the umbonate clavaria, C. pistillaris umbonata.

EXPLANATION OF PLATES

PLATE P

Cortinarius heliotropicus Pk.

HELIOTROPE CORTINARIUS

1 Immature plant with unexpanded pileus
2 Immature plant with expanded pileus
3 Mature plant with unspotted pileus
4 Mature plant with spotted pileus
5 Vertical section of the upper part of an immature plant
6 Vertical section of the upper part of a mature plant
7 Four spores, x 400

Pholiota appendiculata Pk.

APPENDICULATE PHOLIOTA

8 Young plant showing unbroken veil beneath the pileus
9 Young plant showing stem and pileus
10, 11 Two immature plants, one showing lamellae beneath the pileus

12, 13 Two mature plants, one showing lamellae beneath the pileus
14, 15 Vertical sections of two young plants
16 Vertical section of the upper part of a mature plant
17 Four spores, x 400

PLATE Q

Lactarius brevis Pk.

SHORT LACTARIUS

1 Young plant
2 Mature plant with convex pileus
3 Mature plant with fully expanded pileus
4 Vertical section of a plant showing the color which the flesh soon assumes on exposure to the air
5 Four spores, x 400

Boletus rugosiceps Pk.

ROUGH CAP BOLETUS

6 Young plant showing small pileus and large stem
7 Immature plant showing pale yellow tubes
8 Mature plant
9 Vertical section of the upper part of a plant
10 Four spores, x 400

PLATE R

Boletus atkinsoni Pk.

ATKINSON'S BOLETUS

1 Immature plant
2 Mature plant
3 Vertical section of the upper part of an immature plant
4 Vertical section of the upper part of a mature plant
5 Four spores, x 400

PLATE 87

Lepiota cepaestipes Sow.

ONION-STEMMED LEPIOTA

1 Cluster of three young plants
2 Cluster of six plants, four of them with caps mature
3 Vertical section of the upper part of a plant
4 Transverse section of a stem
5 Four spores, x 400

PLATE 88

Hygrophorus nitidus B. & C.

SHINING HYGROPHORUS

1, 2 Two plants with moist yellow caps
3, 4 Two plants after the excess of moisture has escaped
5 Vertical section of the upper part of a plant
6 Transverse section of a stem
7 Four spores, x 400

Hygrophorus laurae decipiens Pk.

DECEIVING HYGROPHORUS

8 Cluster of five plants with moist caps
9 One plant after the excess of moisture has escaped. The lower part of the stem has been removed
10 Vertical section of the upper part of a plant
11 Four spores, x 400

PLATE 89

Boletus laricinus Berk.

LARCH BOLETUS

1, 2 Two small young plants showing scales on the caps
3 One small but mature plant with no scales on the cap
4, 5 Two mature plants of usual size
6 Vertical section of the upper part of a plant
7 Four spores, x 400

PLATE 90

Boletus rubropunctus Pk.

RED DOTTED BOLETUS

1, 2 Two immature plants with red caps and reddish stems
3 An immature plant with paler cap and stem
4, 5, 6 Three mature plants
7 Vertical section of the upper part of an immature plant
8 Vertical section of the upper part of a mature plant
9 Four spores, x 400

PLATE 91

Boletus nobilis Pk.

NOBLE BOLETUS

1 An immature small plant
2 A mature plant of medium size
3 Vertical section of the upper part of a plant
4 Four spores, x 400

PLATE 92

Strobilomyces strobilaceus (Scop.) Berk.

CONELIKE BOLETUS

1 A small immature plant
2 A larger immature plant showing the whitish tube mouths
3 A mature plant of medium size
4 Vertical section of the upper part of an immature plant
5 Vertical section of the upper part of a mature plant
6 Four spores, x 400

PLATE 93

Clavaria pistillaris L.

LARGE CLUB CLAVARIA

1, 2 Two plants, one showing cracks in the apex
3 Vertical section of a plant
4 Four spores, x 400

Clavaria botrytoides Pk.

GRAPELIKE CLAVARIA

5 Immature plant with tips of branchlets red
6 Mature plant with most of the tips colored like the branches
7 Four spores, x 400

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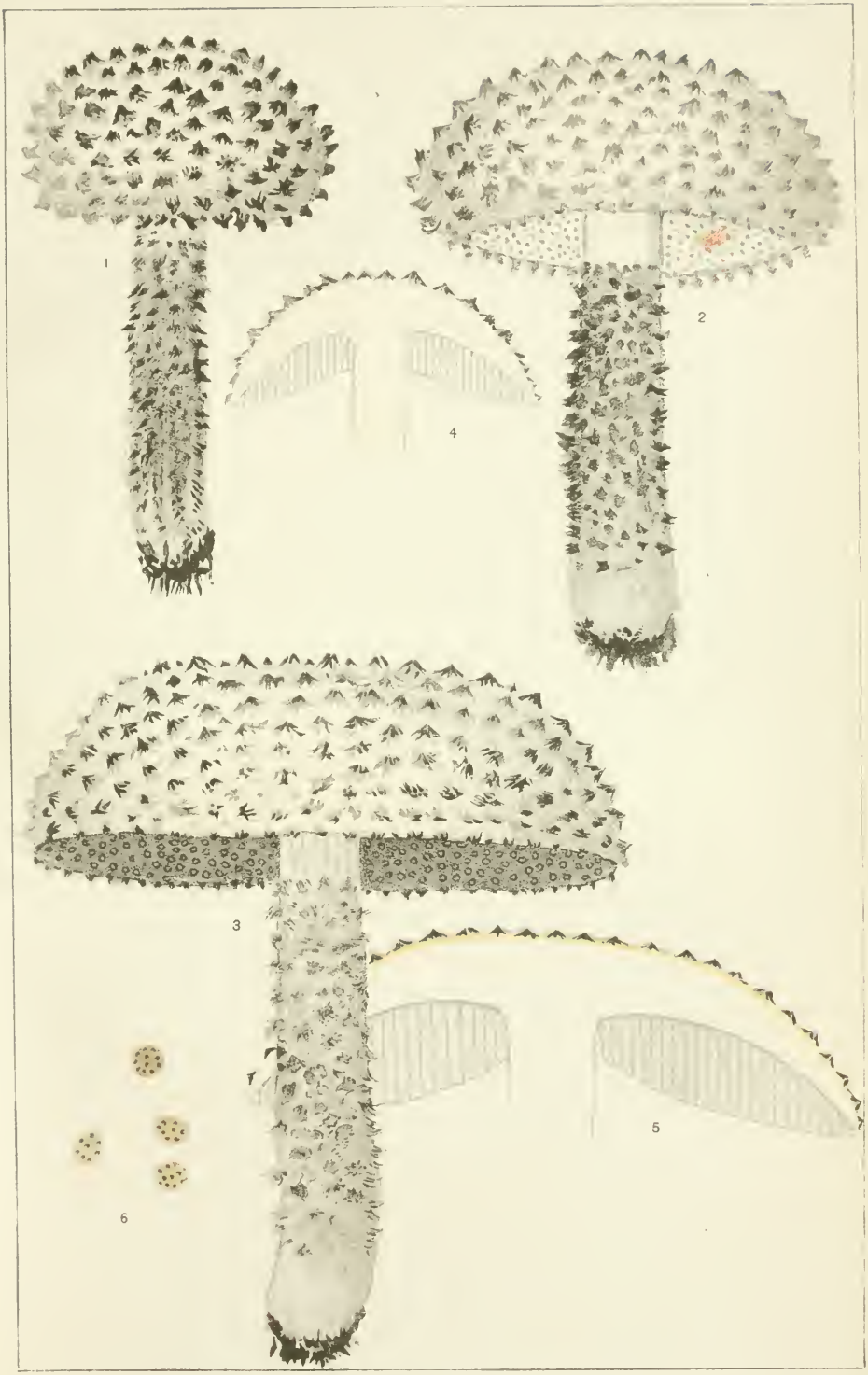
LEPIOTA CEPAESTIPES SOW.
ONION-STEMMED LEPIOTA

FIG. 1-7 HYGROPHORUS NITIDUS B.&C. FIG. 8-11 H. LAURAE DECIPIENS PR

BOLETUS LARICINUS BERK.
LARCH BOLETUS

BOLETUS RUBROPUNCTUS PK.
RED DOTTED BOLETUS

BOLETUS NOBILIS PK.
NOBLE BOLETUS



STROBILOMYCES STROBILACEUS (SCOP.) BERK.
CONE-LIKE BOLETUS

FIG. 1-4 CLAVARIA PISTILLARIS L.
LARGE CLUB CLAVARIA

FIG. 5-7 C. BOTRYTOIDES PK.
GRAPE-LIKE CLAVARIA

FIG. 1-7 CORTINARIUS HELIOTROPICUS PK. FIG. 8-17 PHOLIOTA APPENDICULATA PK
HELIOTROPE CORTINARIUS APPENDICULATE PHOLIOTA

FIG. 1-5 LACTARIUS BREVIS PK.
SHORT LACTARIUS

FIG. 6-10 BOLETUS RUGOSICEPS PK.
ROUGH CAP BOLETUS

BOLETUS ATKINSONI PK.
ATKINSON'S BOLETUS

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